

Fishery Management Report No. 01-4

Fishery Management Report for Sport Fisheries in the Upper Tanana River Drainage in 1999 and 2000

by

James Parker

March 2001

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)		General		Mathematics, statistics, fisheries
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis H_A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm e
gram	g	and	&	catch per unit effort CPUE
hectare	ha	at	@	coefficient of variation CV
kilogram	kg	Compass directions:		common test statistics F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval C.I.
liter	L	north	N	correlation coefficient R (multiple)
meter	m	south	S	correlation coefficient r (simple)
metric ton	mt	west	W	covariance cov
milliliter	ml	Copyright	©	degree (angular or temperature) °
millimeter	mm	Corporate suffixes:		degrees of freedom df
		Company	Co.	divided by \div or / (in equations)
		Corporation	Corp.	equals =
		Incorporated	Inc.	expected value E
		Limited	Ltd.	fork length FL
		et alii (and other people)	et al.	greater than >
		et cetera (and so forth)	etc.	greater than or equal to \geq
		exempli gratia (for example)	e.g.,	harvest per unit effort HPUE
		id est (that is)	i.e.,	less than <
		latitude or longitude	lat. or long.	less than or equal to \leq
		monetary symbols (U.S.)	\$, ¢	logarithm (natural) ln
		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10) log
		number (before a number)	# (e.g., #10)	logarithm (specify base) \log_2 , etc.
		pounds (after a number)	# (e.g., 10#)	mid-eye-to-fork MEF
		registered trademark	®	minute (angular) '
		trademark	™	multiplied by x
		United States (adjective)	U.S.	not significant NS
		United States of America (noun)	USA	null hypothesis H_0
		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent %
				probability P
				probability of a type I error (rejection of the null hypothesis when true) α
				probability of a type II error (acceptance of the null hypothesis when false) β
				second (angular) "
				standard deviation SD
				standard error SE
				standard length SL
				total length TL
				variance Var
Weights and measures (English)				
cubic feet per second	ft ³ /s			
foot	ft			
gallon	gal			
inch	in			
mile	mi			
ounce	oz			
pound	lb			
quart	qt			
yard	yd			
Spell out acre and ton.				
Time and temperature				
day	d			
degrees Celsius	°C			
degrees Fahrenheit	°F			
hour (spell out for 24-hour clock)	h			
minute	min			
second	s			
Spell out year, month, and week.				
Physics and chemistry				
all atomic symbols				
alternating current	AC			
ampere	A			
calorie	cal			
direct current	DC			
hertz	Hz			
horsepower	hp			
hydrogen ion activity	pH			
parts per million	ppm			
parts per thousand	ppt, ‰			
volts	V			
watts	W			

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by
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Division of Sport Fish

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PREFACE

The goals of the Sport Fish Division of the Alaska Department of Fish and Game are to conserve wild stocks of sport fish, to provide a diversity of recreational fishing opportunities, and to optimize social and economic benefits from recreational fisheries. This report provides sport fisheries management information for 1999/2000 within the Upper Tanana Management Area, commonly referred to as “Delta Area”. Management strategies developed in this report are a result of biological assessment (current and prior research projects), and input from user groups. Reviews of these strategies are done on an annual basis. Research prioritization occurs during the “area review” process prior to each field season. Other information included in this report are a description of the fisheries regulatory process, the geographic boundary of the area, angler access information, and fish stocking within the upper Tanana River Management Area. Funding sources for management of the Upper Tanana River come from a combination of State of Alaska Department of Fish and Game (F&G) and Federal Aid in Fisheries Restoration (D-J) monies. D-J funds are provided to the states at a match of up to three-to-one with the F&G funds. There is also an amendment to the D-J Act (W-B, for Wallop-Breaux) that provides money to states for boating access projects. Funding for research on the Goodpaster River Arctic grayling resource comes from a private industry contract (TECK Corporation).

INTRODUCTION

The Alaska Board of Fisheries (BOF) divides the state into ten regulatory areas for the purpose of organizing the sport fishing regulatory regime by drainages and fisheries. These areas (not to be confused with Regional management areas) are described in Title 5 of the Alaska Administrative Code (5 AAC). Sport Fish Division of the Alaska Department of Fish and Game (ADF&G) divides the state into three administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas (Figure 1). Region I is Southeast Alaska. Region II covers portions of South-central Alaska, Kodiak, Southwestern Alaska, and the Aleutian Islands. Region III includes two and most of a third of the BOF fishery regulatory areas. They are the Upper Copper and Upper Susitna regulatory area, the Arctic-Yukon-Kuskokwim regulatory area, and the Tanana River drainage.

Region III is the largest geographic region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 1,251,300 km² (485,000 mi²) of land, some of the state's largest river systems (the Yukon, portions of the Kuskokwim, the Colville, Noatak, and upper Copper River and upper Susitna River drainages), thousands of lakes, and thousands of miles of coastline and streams. Regional coastline boundaries extend from Sheldon Point in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River valley. Fairbanks (population about 31,000) is the largest community.

For administrative purposes Sport Fish Division has divided Region III into six fisheries management areas (Figure 1). They are: Northwestern Management Area (Norton Sound, Seward Peninsula and Kotzebue Sound drainages); AYK Management Area (the North Slope drainages, the Upper Yukon River except the Tanana River drainage, and the Upper Kuskokwim River drainage upstream from the Aniak River); Lower Yukon lower Kuskokwim Management Area, Upper Copper/Upper Susitna Management Area (the Copper River drainage and the Susitna River drainage above the Oshetna River); Upper Tanana River Management Area (The Tanana River drainage upstream from Banner Creek and the Little Delta River); and, Lower Tanana River Management Area (The Tanana River drainage downstream from Banner Creek and the Little Delta River). Area offices for the six areas are located in Nome, Fairbanks, Bethel, Glennallen, Delta Junction, and Fairbanks, respectively. In March of 2000, the Bethel area office was added to accommodate the Lower Kuskokwim River and Lower Yukon River area Fisheries.

The Tanana River drainage is divided into two separate management areas because it contains population centers that result in a large amount of angling effort on local fishery resources. Intensive, stock specific studies are required in the Tanana drainage to provide biological and fishery management information because of the higher fishery exploitation rates. This report details the management activities in the Delta area.

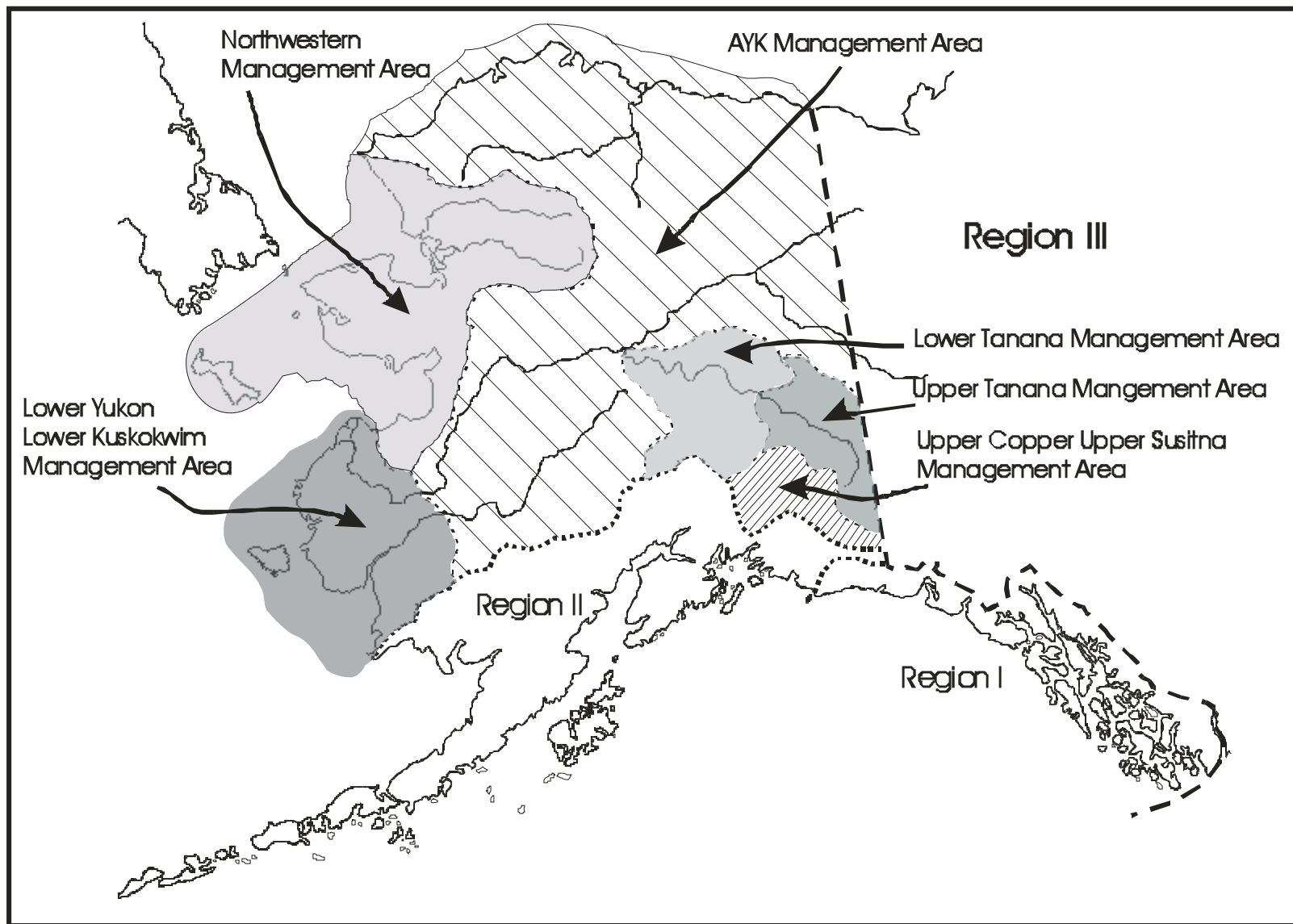


Figure 1.- Map of the sport fish regions in Alaska and the six Region III management areas.

The Alaska Board of Fisheries (BOF) is the seven-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. Board members are appointed by the Governor and must be confirmed by the legislature. Board members are appointed for three years. Statewide fisheries issues may be considered at any BOF meeting. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. The BOF meetings are usually in the winter, between early October and late March. Regulation proposals and management plans are received for evaluation by the BOF from ADF&G, local advisory committees, and the public (any Alaskan can submit a proposal to the BOF). On April 10, 2000 proposals were due to the BOF for Yukon River drainage issues. During its deliberations the BOF receives input and testimony through oral and written reports from staff of the Alaska Department of Fish and Game, members of the general public, representatives of local fish and game Advisory Committees, and special interest groups such as fishermen's associations and clubs.

Under the Alaska National Interest Lands Conservation Act (ANILCA) the Federal Government requires the State of Alaska to establish subsistence use of fish and game by rural residents as the top priority of possible uses, and establishes rules to which that State priority must conform. This is unconstitutional under State law, which requires equal access to those resources for all citizens. Should the State not amend the Constitution of the State of Alaska to comply with the Federal law, managers of Federal Lands in Alaska are obligated by ANILCA to implement that priority on Federal Lands.

A Federal System has been created that establishes ten federally funded Regional Advisory Councils (RAC's) providing recommendations to the Federal Subsistence Board to ensure that the rural priority for fish and game use is implemented on Federal lands statewide. The RAC's make recommendations to a Federal Subsistence Board, which then codifies them into Federal law. Beginning October 1, 1999 the Federal Government implemented their subsistence fisheries management program. The federal program has put out a schedule for taking subsistence fisheries proposals for 2001. Proposals will be accepted January 4 thru March 24, 2000. Public comment will be May 1-31, 2000 with RAC recommendations taken September 11-October 20, 2000. The Federal Subsistence Board will meet and take action December 4-8, 2000 and the new regulations will go into effect March 1, 2001. One proposal (F2001-08) affects the Tanana River drainage, which essentially requires a subsistence permit for Salmon only, whereas, a subsistence permit would not be required for other species.

The ADF&G has emergency order (E.O.) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Emergency orders are implemented to deal with conservation issues that arise that are not adequately controlled by existing regulations. In that scenario, they deal with the situation until it is resolved or the BOF can formally take up the issue. Emergency Orders are also the mechanism by which "in-season" management of fisheries is accomplished. In-season management is usually in accordance with a fisheries management plan approved by the BOF.

The Region III Sport Fish Division staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, an area management biologist for each of the six management areas, one or more

assistant area management biologists, and two stocked waters biologists. The area biologists evaluate fisheries and propose and implement management strategies through plans and regulations in order to meet Divisional goals. Interaction with the BOF, Advisory Committees, and the general public is an important part of their job. The stocked waters biologists plan and implement the Regional stocking program for recreational fisheries.

The research group consists of a research supervisor, six research biologists (in 1999), and various field assistants. The research biologists plan and implement fisheries research projects in order to provide information needed by the management group to meet Divisional goals. The duties of the management and research biologists overlap somewhat.

Recreational angling effort, catch, and harvest of important sport fish species in Alaska has been estimated and reported annually since 1977 (Mills 1979-1994, Howe et al. 1995-1999, Howe et al. *In print*). This estimation is done through the statewide harvest survey; a questionnaire mailed out to a random selection of sport fish license purchasers. Estimates for a particular year usually become available in September of the following year. Effort, catch, and harvest are estimated on a site-specific basis, but estimates of effort directed toward a single species and the resulting species-specific catch-per-unit-effort (CPUE) information is not provided by the report. Utility of the estimates is strongly dependant on the number of responses for a site (Mills and Howe, 1992). Estimates based on 12 or less responses are useful only to document that fishing occurred. Twelve to 29 responses produce estimates useful for indicating relative order of magnitude and for assessing long-term trends, and estimates based on 30 or more responses generally provide estimates with reasonable variability.

This report summarizes fisheries information for 1999 and 2000. This report is organized into two major sections. Section I provides an overview of the Delta Area. Included is a Delta Area description, Board of Fisheries activities, and information pertaining to management, stocking, research, and access program activities conducted. Section II provides a more detailed summary of each fishery and has special management concerns identified during the reporting period. Included in these summaries are: a fishery description, fishery management objective, a description of recent performance of the fishery; a description of recent Board of Fishery actions related to the fishery, a discussion of social or biological issues that may be associated with each fishery, a summary of current research and management activities related to each fishery, and an outlook for the 2001 fishing season.

SECTION I: MANAGEMENT AREA OVERVIEW

The Tanana River is the second largest tributary of the Yukon River. The Tanana River basin (Figure 2) drains an area of approximately 116,500 km² (11.7 million ha). The main river is a large glacial stream formed at the confluence of the Chisana and Nebesna rivers near Tok. The Tanana River flows in a generally northwest direction for some 917 km. The Tanana Drainage is split into the Upper Tanana and Lower Tanana management areas because of the intensive effort and high sport fishery exploitation levels in this region of Alaska. Sport fishing effort in the Tanana River drainage was 160,427 angler-days (53% of the total effort in Region III and 6.4% of the State of Alaska total (Howe et

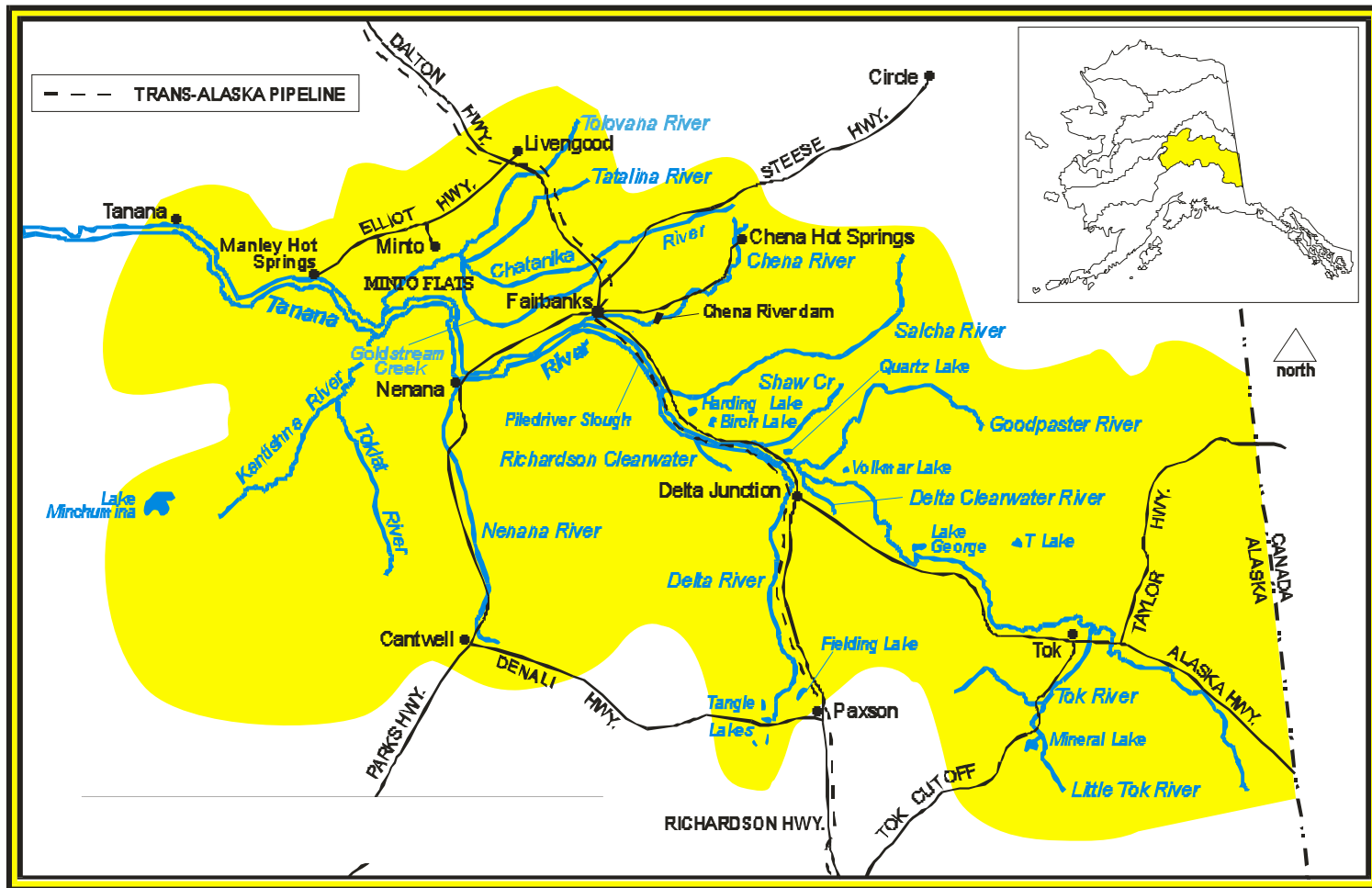


Figure 2.-Map of the Tanana River drainage.

al. 2000). During this reporting period Mike Doxey was Area Management Biologist for the Fairbanks Area and is stationed in Fairbanks. Fronty Parker, Area Management Biologist stationed in Delta Junction Alaska Department of Fish and Game field office, manages the Delta Area. Dave Davenport a Fish and Game Technician II, provides fishery information for six months at the Delta Junction Field office. William Ridder (Biologist II) who conducted Arctic grayling research in the region for over 20 years retired January 1, 2000 was also stationed at the Delta Field Office during 1999. Andy Gryska replaced William Ridder as the Arctic grayling researcher, but is stationed in Fairbanks for the year. Lucia Zaczkowski, a Field Office Assistant is partially funded (two months) by Sport Fish Division to provide fishery information at the Tok Fish and Game field office.

UPPER TANANA RIVER MANAGEMENT AREA DESCRIPTION

The boundary between the Fairbanks Area and the Delta Area is the Fairbanks North Star Borough boundary. North of the Tanana River this leaves the Salcha River drainage within the Fairbanks Area and Shaw Creek drainage in the Delta Area. The Fairbanks North Star Borough boundary crosses the Richardson Highway (near Banner Creek) at Milepost 295 (Figure 3). On the South side of the Tanana River the Western-most part of the Delta Area is confined by the Matanuska-Susitna, Denali, and Fairbanks North Star boroughs, this includes the Little Delta River drainage in the Delta Area. The Eastern-most extent of the Tanana River drainage includes the Alaska portion of the White River. The Southern-most extent of the drainage is the Tangle Lakes System (Delta River) along the Denali Highway and the headwaters of the Nabesna River at the end of the Nabesna Road. Communities located within the Upper Tanana drainage are Big Delta, Delta Junction, Fort Greely, Dot Lake, Tanacross, Mansfield, Tok, Tetlin, Northway, and Nabesna. There are unique fishing opportunities found in the Delta area, such as the high elevation waters found along the Denali Highway that support lake trout populations. These waters also have the only known Dolly Varden populations in the Tanana River drainage but these fish are not sought as other species are. In addition, numerous spring-fed waters near Delta Junction provide critical habitat for the largest coho salmon spawning concentration in the Yukon River. Because of the warm spring water, spawning coho's provide the last open water fishing opportunity in the region. In addition to the coho's spawning in the spring-fed systems, Arctic grayling migrate during the summer months to these springs as well. These are adult Arctic grayling having a larger than average size and provide a desirable trophy sized fishery in the Delta Clearwater and Richardson Clearwater Rivers.

Recreational angling effort and harvest in the Tanana drainage has been estimated since 1977 using a mail-out survey (Mills 1979-1994, Howe et al. 1995-1999 and Howe et al. *In print*).

The survey is designed to provide estimates of effort and harvest on a site-by-site basis and, unfortunately, is not designed to provide estimates of effort directed towards a particular species. Effort and harvest between the two management areas within the drainage have been partitioned out and will be reviewed later in this report.

The decline in effort between 1997 and 1998 appears to have been a statewide phenomena, the decline appears to have reversed itself in 1999. Howe (et al. 1999)

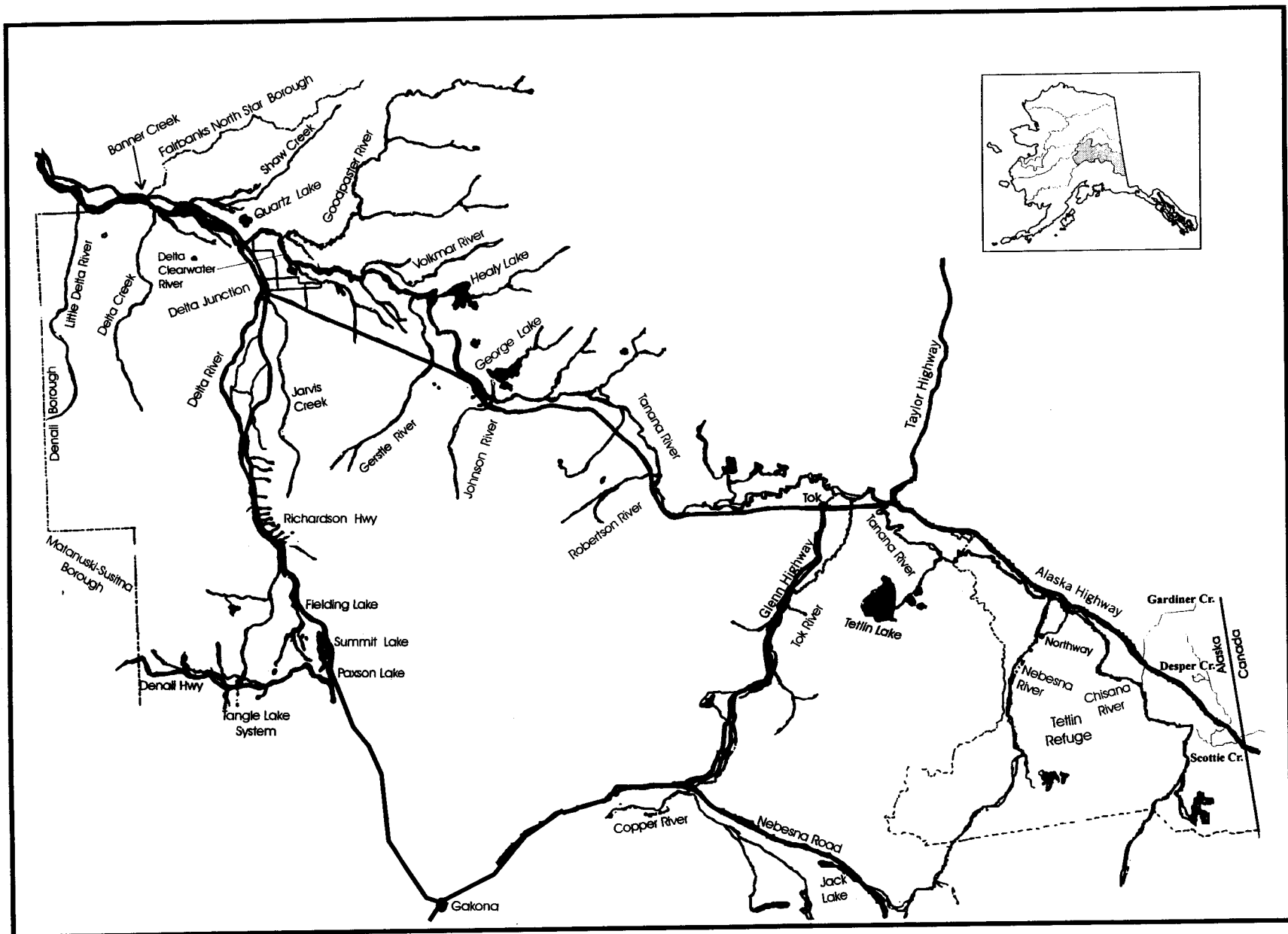


Figure 3.-Map of the Delta Management Area within the Tanana River drainage.

reported that statistically significant nonresponse bias (NRB) had not been corrected for to produce the 1995-1997 estimates of days fished and trips. These estimates would be biased high. The recalculation of these values indeed showed declines in effort during 1997 and 1998 (A. Howe 2000, Alaska Department of Fish and Game Intranet posting of recalculated data). Only effort estimates, not harvest, are affected by this error. The 1995-1998 new effort estimates are reflected in this report.

ALASKA BOARD OF FISHERIES AND ADVISORY COMMITTEES

Regulations for the Tanana Drainage sport fisheries are found in Chapter 70 of Title 5 of the Alaska Administrative Code. Regulations for specific waters in the Delta Area are under the Tanana River portion (5 AAC 70.022 d) of the Arctic-Yukon-Kuskokwim Area. The Alaska Board of Fisheries (BOF) process establishes regulations for fisheries in the Tanana Drainage. Under the current operating schedule, the BOF considers regulations for all of the AYK area on a 3-year cycle. The last BOF meeting for Region III issues occurred in December of 1997 and proposals concerning the Delta area for the next BOF meeting (January 2001) were due April 10, 2000. During the writing of this report, 32 proposals (183-214) were submitted to the BOF concerning the Tanana River drainage, all but six pertain to the Delta Area. In addition, there are three gear and permit proposals (165, 181, and 182) that involve Personal Use and Subsistence fishing in the Tanana River drainage that are of a sport fish interest. Public input concerning regulation changes is provided for in this process through direct testimony to the BOF and through participation in local fish and game advisory committees. Advisory committee meetings allow opportunity for direct public interaction with Department staff. In this way, the public can ask questions and staff can provide clarification to proposed regulatory changes. The Boards Support Section within the Division of Administration provides administrative and logistical support for the BOF and Fish and Game advisory committees. Jim Marcotte is the Interior Region coordinator, stationed in Fairbanks. There are two advisory committees in the Delta area that represent resource users: Delta and Upper Tanana/Forty Mile. The Chairman of the Delta advisory committee is Larry Fett; Mary Beth Hennessy is chair of the Upper Tanana/Forty Mile committee. Mike Cronk of Northway replaced Mary Beth Hennessy as chairman in 2000. These two committees meet on a monthly or bi-monthly schedule throughout the fall and winter months. To address conservation emergencies between BOF meetings, the Delta area manager has emergency order authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. No Emergency Orders were issued during 1999 for the Delta area.

FEDERAL SUBSISTENCE REGIONAL ADVISORY COUNCIL

The Secretary of the Interior appoints member of the Federal Subsistence Board (FSB). He also approves the members of the Subsistence advisory council of which there are ten in Alaska. The FSB is responsible for Customary and Traditional use determinations and hunting and fishing regulations on federal land. The ten Regional Subsistence Advisory Councils receive regional requests for federal actions on subsistence desires and identifies subsistence needs, uses, methods, and recommends allocations of resources and harvest circumstances. The Delta area is within the Eastern Interior Federal subsistence regional advisory council region (includes Game Management Units 12, 20 and 25). These regional councils until recently have only had to deal with wildlife issues on

Federal lands. However, in 1998 discussions began as to what advisory role regional councils would have concerning fisheries if the State did not resolve the rural subsistence priority. The Federal Government would take over Fisheries Management on Federal waters October 1, 1999 if nothing were done. This would extend jurisdiction for fisheries to federal inland waters on federal selected land, land selected but not yet conveyed, recreation and conservation areas, and forest additions are included in this program. In addition, the FSC may extend their authority off of Federal land in certain circumstances.

The Eastern Interior Council met in Delta Junction on February 27-28, 1999, in Fort Yukon on October 5-7, 1999, and a joint Western and Eastern Interior RAC meeting in Fairbanks on February 22-24, 2000. During the February 1999 meeting the Eastern Council RAC discussed the fishery regulatory Process. The RAC will consider requests for change in regulations for the 2001 fishing season. Formal proposals will be taken up by RACs in fall 2000 and by the FSB in December 2000. One Federal proposal was submitted (FP01-6) which would repeal the requirement for subsistence fishermen harvesting non-salmon species in the Tanana River upstream of the Fairbanks Non-subsistence Area to have a permit. Users would continue to be required to have a subsistence permit to harvest salmon. Elimination of this requirement would leave the department with less means to detect changes in stock status from the harvest records.

One fishery issue that was discussed in the February 1999 meeting was that communities represented by this council are unhappy with the commercial fishery, occurring primarily in the lower river, preventing them from obtaining the number of king and fall chum that they require.

The main sport fish related topic discussed in the February 2000 meeting was the practice of catch and release fishing. Several members voiced their concern over the negative impacts of this kind of activity. A couple of the council members voiced the belief that the “incidental mortality” caused by catch and release fishing is far greater than the estimated rates reported from various studies conducted by agency biologists. The argument is basically that many (most) anglers don’t treat the fish as gently as do the people conducting the studies. It was suggested that many anglers might kill 50% of the fish they “release” resulting in dead fish in excess of allowable bag limits.

Federal Lands within the Delta Area are: 1) Tetlin Refuge some 730,000 acres (Figure 3) which includes much of the Nebesna and Chisana Rivers, 2) Fort Greely, 661,000 acres of US Military lands near Delta Junction, 3) Delta River Wild and Scenic River Corridor which is approximately 37,000 acres in size and 62 miles in length from the upper most lakes in the Tangle Lakes System to confluence of Black Rapids Glacier to the Delta River, 4) the Tangle Lakes Archaeological District which is 460,000 acres and encompasses waters along the first 35 miles of the Denali Highway from Paxson (The initial 37 miles of the Delta Wild and Scenic River Corridor is included in the Archaeological district), and 5) the headwaters of the Chisana and Nabesna Rivers are with the Wrangle-St. Elias National Preserve adjacent to the Tetlin National Refuge.

FISHERY RESOURCE INVENTORY

There are 17 fish species known in the Delta area of which 10 are species commonly targeted by sport anglers. They include: king salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, chum salmon *Oncorhynchus keta*, Arctic grayling

Thymallus arcticus, burbot *Lota lota*, lake trout *Salvelinus namaycush*, Dolly Varden *Salvelinus malma*, round whitefish *Coregonus cylindraceum*, least cisco *Coregonus sardinella*, humpback whitefish *Coregonus pidschian*, and northern pike *Esox lucius*. Rainbow trout *Oncorhynchus mykiss* are not native to the drainage, but have been stocked in several locations. Arctic char *Salvelinus alpinus*, coho salmon, Arctic grayling and lake trout have also been stocked in selected waters of the Delta Area.

STATEWIDE HARVEST SURVEY DESCRIPTION

Recreational angling effort in the Tanana drainage has been estimated since 1977 using a statewide mail-out survey (Mills 1979-1994, Howe et al. 1995-1999, and Howe et al. *In print*) administered by Regional Technical Services (RTS) of the Sport Fish Division. This Statewide Harvest Survey (SWHS) estimates the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as the catch and harvest of important sport species. The survey is designed to provide estimates of effort and harvest on a site-by-site basis; however, the survey does not provide estimates of effort directed towards a particular species. The standard questionnaire used annually since 1977 was mailed to 25,000 households containing at least one individual who purchased a 1999 sport fishing license or a valid permanent identification card for sport fishing. Each household was asked for information for 1999 on number of licensee's, on participation (number of anglers, trips, and days fished), and number of fish caught and number of fish kept (harvested) by species and site. An estimate was generated for catch and harvest for each species and participation by site. Confidence intervals for estimates were calculated using the percentile method of bootstrap resampling with 1,000 replications (Howe et al. 1999). Guidelines (Mills and Howe 1992) for evaluating the utility of the estimates are: 1) other than to document that sport fishing occurred, estimates based on fewer than 12 responses should not be used, 2) estimates based on 12-29 responses can be useful in indicating relative order of magnitude and for assessing long-term trends, and, 3) estimates based on 30 or more responses are generally usable. For the larger fisheries harvest results have been consistent with onsite creel surveys (Mills and Howe 1992). For the most part, use of SWHS data has replaced onsite creel surveys. Because of the timeliness of the results, estimates cannot be used for inseason management and are not recommended for compliance with regulatory and management policies, quotas, and guidelines (Howe et al. 1999).

As reported in Parker (2000a), RTS discovered in 1999 that statistically significant nonresponse bias (NRB) correction factors had not been applied to the 1998 estimate of effort. In addition, the NRB's were not applied to the 1995-1997 estimates of effort as well. Therefore the 1998 estimates were not published and NRB statistics were in the process of being applied to all the data from 1995-1998. However, the NRB's were correctly applied to produce estimates of harvest which are unaffected by this error. Estimates of effort are now available from 1995-1998, all using the correct NRB correction factors and are reflected in the tables and text of this report.

RECREATIONAL ANGLER EFFORT, HARVEST AND CATCH

The majority (average 70%) of sport effort in the AYK occurs in the Tanana River drainage. From 1977 through 1999, anglers in the entire Tanana drainage have expended

an average of 144,099 angler-days or 7.0% of the total statewide effort (Table 1, Figure 4). From 1997 to 1999 the Tanana drainage portion ranged from 49% - 53% of the AYK effort due to adding the Glennallen Management Area (Upper Copper and Upper Susitna River drainage's) to the AYK Region in 1997 (Table 1; Parker and Viavant 2000). The fraction of statewide effort expended in the Tanana drainage in 1999 was 6.4% slightly below the 23-year average of 7.0% (Table 1).

From 1977 through 1999, recreational anglers in the Tanana drainage harvested an average of 132,144 fish, accounting for an average of 4.4% of the annual estimated statewide recreational fish harvest and about 68.0% of the total estimated AYK harvest for the same period (Table 2). Sport harvest of all species since 1977 in the Tanana drainage reached a peak in 1988 when over 198,000 fish were harvested (Mills 1989). Total harvest has declined to a low of 64,000 fish in 1997 but increased to nearly 83,000 in 1999, however, still below the 1977-1998 average harvest of 132,000 (Table 2). The harvest of fish in the Delta Area for 1999 was 38,103 fish or 46.1% of the harvest in the Tanana River drainage (Table 3), which is essentially the same as in 1997 and 1998 (Table 3).

Numbers of anglers were also derived differently in 1998 and 1997. As reported by Parker (2000a, Table 2) these values (14,886 in 1998 and 19,585 in 1997) were sums of anglers from Upper Tanana River drainage (UTRD) waters partitioned from the entire TRD. However, number of anglers do not equal sum of sites (Howe et al. 2000), due to some anglers fishing at more than one site. Therefore, values reported for 1997 and 1998 were high. The total number of anglers in the UTRD is derived as a proportion of the total number of TRD anglers (Table 3). From 1997-1999, the number of anglers in the UTRD averaged 32% of the entire TRD while the number of trips averaged 24%, and the average number of angler-days averaged 28% of the TRD (Table 3).

Arctic grayling have been the most harvested species in the TRD until 1988 (Parker and Viavant 2000). Since then rainbow trout have dominated harvests, accounting for 58.3% of the total TRD in 1999 (Table 4). As a result of the stocking program, about 44% of the TRD rainbow trout have been harvested on Delta area lakes (Table 4). In 1999, Arctic grayling accounted for 45%, northern pike for 34%, and burbot for 34%, respectively, of Tanana drainage harvest (Table 4). Rainbow trout and landlocked salmon, both stocked fish, represented 71.4% of the total harvest in the Delta Area (Table 4). Combined, chinook salmon, chum salmon, whitefish, Inconnu (sheefish), and other fish species accounted for less than one percent of the total Delta Area harvest in 1999 (Table 4).

Estimates of the number of fish caught and released by recreational anglers fishing TRD waters became available for the first time during 1990. Estimates of catch (which includes harvest) for this reporting period come from the statewide mail out survey (Howe et al. 1999). A total of 436,560 fish were caught in the TRD of which 161,217 (36.9%) were caught in the Delta area (Table 5 and 6). The same proportion (37%) was reported in 1998 (Parker 2000a). Recreational anglers kept 19.0% of their catch in 1999

Table 1.-Number of angler-days of sport fishing effort expended by recreational anglers fishing Tanana River drainage waters, 1977-1999.

Year	Tanana drainage Effort	Statewide Effort	Tanana Percent of statewide	Region III Effort	Tanana drainage percent of Region III
Average 1977-1981	112,878	1,351,484	8.4	140,780	80.2
1982-1986	144,242	1,847,387	7.8	195,711	73.7
1987-1991	171,063	2,327,570	7.3	231,169	74.0
1992-1996	156,243	2,679,007	5.8	222,751	70.1
1997	119,699	2,006,528	6.0	238,856	50.1
1998	112,025	1,856,976	6.0	227,841	49.2
1999	160,427	2,499,152	6.4	304,522	52.7
Total	3,406,184	47,983,159		4,869,210	
Average	144,099	2,060,430	7.0	205,360	70.2

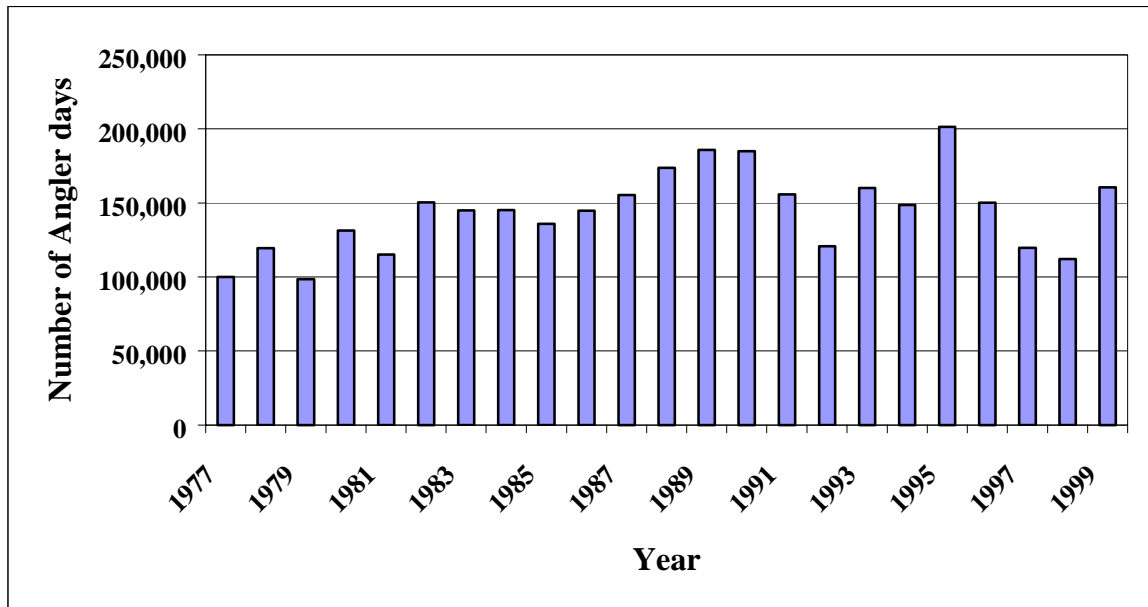


Figure 4.-Angler effort in the Tanana River drainage from 1977 - 1999.

Table 2.-Number of fish harvested by recreational anglers fishing Tanana drainage waters, 1977-1999.

Year	Tanana drainage Harvest	Alaska Harvest	Percent by Tanana drainage Harvest	Region III Harvest	Percent by Tanana drainage Harvest
Average 1977-1981	134,947	2,459,475	5.5%	178,809	75.5%
1982-1986	173,185	3,058,086	5.7%	250,262	69.2%
1987-1991	161,588	3,249,825	5.0%	222,965	72.5%
1992-1996	188,045	3,213,867	5.9%	253,437	74.2%
1997	63,925	3,294,273	1.9%	140,473	45.5%
1998	78,020	3,125,941	2.5%	181,808	42.7%
1999	82,730	3,400,793	2.4%	169,675	48.8%
1977-1999	3,039,305	69,516,458		4,443,062	
Average	132,144	3,005,258	4.4%	194,245	68.0%

Table 3.-Effort and harvest in the Tanana River drainage and Delta Area, 1997 - 1999.

Year	Number of anglers in Delta Area	Percent of Tanana drainage	Number of trips in Delta Area	Percent of Tanana drainage	Number of days (effort) in Delta Area	Percent of Tanana drainage	Total harvest in Delta area	Percent of Tanana drainage
1997	8,241	26%	20,634	23%	30,635	25%	29,564	46%
1998	11,886	38%	20,051	25%	31,411	28%	36,955	47%
1999	9,637	31%	22,839	24%	46,809	29%	38,103	46%
Average								
1997-1999	9,921	32%	21,175	24%	36,285	28%	34,874	47%

Table 4.-Number of fish harvested and caught by recreational anglers fishing Tanana River drainage waters, including the proportion within the Delta area, 1999.

Species	Tanana River Harvest	Delta area Harvest	% Delta Harvest	Tanana River Catch	Delta area Catch	% Delta Catch
Salmon:						
Chinook	1,001	21	2.1%	4,176	45	1.1%
Coho ^a	451	322	71.4%	2,239	1,941	86.7%
Coho ^b	8,637	6,016	69.7%	27,010	16,960	62.8%
Chum	474	85	17.9%	2,230	588	26.4%
Non-Salmon:						
Rainbow Trout	48,226	21,178	43.9%	140,379	61,372	43.7%
Lake Trout	1,145	818	71.4%	4,480	3,424	76.4%
Char ^c	4,851	2,322	48.1%	16,898	9,475	56.1%
Arctic Grayling	11,523	5,225	45.3%	215,224	58,560	27.2%
Northern Pike	2,925	1,016	34.7%	17,786	7,044	39.6%
Whitefish	235	16	6.8%	1,353	377	27.9%
Burbot	3,148	1,074	34.1%	4,572	1,431	31.3%
Sheefish	114	0	0.0%	173	0	0.0%
Other Fish	0	0	0.0%	40	0	0.0%
Total	82,730	38,103	46.1%	436,560	161,217	36.9%

^a Anadromous salmon.

^b Landlocked Coho and Chinook salmon

^c Includes Arctic char and Dolly Varden.

Table 5.-Number of fish caught and harvested (kept) by recreational anglers fishing Tanana River drainage waters during 1999.

Species	Catch	Harvest	Percent Harvested
Salmon:			
Chinook	4,176	1,001	24.0%
Coho ^a	2,239	451	20.1%
Coho ^b	27,010	8,637	32.0%
Chum	2,230	474	21.3%
Non-Salmon:			
Rainbow trout	140,379	48,226	34.4%
Lake Trout	4,480	1,145	25.6%
Char ^c	16,898	4,851	28.7%
Arctic grayling	215,224	11,523	5.4%
Northern pike	17,786	2,925	16.4%
Whitefish	1,353	235	17.4%
Burbot	4,572	3,148	68.9%
Sheefish	173	114	65.9%
Other fish	40	0	0.0%
Total	436,560	82,730	19.0%

^a Anadromous salmon.

^b Landlocked coho and chinook salmon

^c Includes Arctic char and Dolly Varden.

Table 6-Number of fish caught and harvested (kept) by recreational anglers fishing the Delta Area portion of the Tanana River drainage in 1999.

Species	Catch	Harvest	Percent Harvested
Salmon:			
Chinook	45	21	46.7%
Coho ^a	1,941	322	16.6%
Coho ^b	16,960	6,016	35.5%
Chum	588	85	14.5%
Non-Salmon:			
Rainbow trout	61,372	21,178	34.5%
Lake Trout	3,424	818	23.9%
Char ^c	9,475	2,332	24.6%
Arctic grayling	58,560	5,225	8.9%
Northern pike	7,044	1,016	14.4%
Whitefish	377	16	4.2%
Burbot	1,431	1,074	75.1%
Sheefish	0	0	0.0%
Other fish	0	0	0.0%
Total	161,217	38,103	23.6%

^a Anadromous salmon.

^b Landlocked coho and chinook salmon

^c Includes Arctic char and Dolly Varden.

(Table 5), while anglers in the Delta area portion of the TRD harvested 23.6%, with nearly every species having a higher harvest rate (Tables 5 and 6).

The catch rates were similar between the Delta Area (23.6%) and that of the rest of the TRD (19.0%). Rainbow trout, which are caught in the greatest numbers, have the same harvest rate (34%) between the Delta Area and the rest of the drainage. Burbot, which are typically harvested, rather than released, were harvested at a rate of 70% in the TRD and in the Delta area portion at 75%. Considerable variability exists in the percent of fish released, depending on the species. For example in the Delta area, 75% of the burbot caught in 1999 were harvested, whereas only 8.9% of Arctic grayling and 4.2% of the whitefish caught, were harvested (Table 6). Anglers in the Delta Area apparently are practicing catch-and-release more each year. In 1998, Delta Area fishermen kept 25% (Parker 2000a) of their catch and 23.6% in 1999 (Table 6). Fewer harvested rainbow trout and Arctic grayling, which are the bulk of the fish caught in the Delta Area, is influencing less overall harvest in the Delta area.

MANAGEMENT AND RESEARCH ACTIVITIES

All activities in Region III are directed by Regional Supervisor, Mac Minard, who delegates tasks to the Administrative Assistant (Terra Shideler), the Research Supervisor (Peggy Merritt) and the Management Supervisor (Charles Swanton). For the Delta Area, Charles Swanton directs the activities of the Area Management Biologist, Fronty Parker. Peggy Merritt directs research Biologist Bill Ridder, stationed in Delta Junction, who was responsible for Arctic grayling studies in the Tanana River drainage during 1999. Beginning in January 2000, Andrew Gryska took over grayling research responsibilities. Cal Skaugstad from the Fairbanks office directs Lake stocking activities. Brendan Scanlon stationed in Fairbanks conducted Northern pike research at Volkmar Lake in May of 2000. Tim Viavant also stationed in the Fairbanks office directs access projects.

The management staff in Region III began drafting Fishery Management Plans in 1992 for each important fishery. Each of the plans, including those listed below for the Delta area, were finalized in 1993. Managers use the plans as annual planning and evaluation tools. In January the management staff will discuss fishery by fishery the objectives and course of action if necessary based upon these plans. To date none of these plans have been officially changed or updated. However, by the end of 2001, management plans for the Delta Clearwater River Arctic grayling and Goodpaster River fishery will be updated. The Delta Area Plans and the date finalized are as follows:

1. Quartz Lake Stocked Lake Sport fishery, June 1992
2. Small Stocked Lakes Sport Fishery, June 1992
3. Delta Clearwater River Coho salmon fishery, April 1993.
4. George Lake sport fishery, April 1993.
5. Volkmar Lake, April 1993.
6. Tangle Lake System sport fishery, May 1993.
7. Delta Clearwater River Arctic grayling sport fishery, June 1993.
8. Fielding Lake sport fishery, June 1993.

9. Goodpaster River sport fishery, June 1993.
10. Richardson Clearwater River sport fishery, June 1993.
11. Shaw Creek sport fishery, June 1993.
12. Tanana River Burbot sport fishery, June 1993.

COMMERCIAL SALMON HARVESTS

Tanana River stocks of chum, chinook, and coho salmon provide commercial fisheries in the Tanana River District. Commercial fishing is allowed by emergency order in three statistical areas (6a,b, c), from the mouth of the Tanana River to the mouth of the Chena River. Commercial fishing above the mouth of the Chena River is prohibited, precluding any commercial activity in the Delta area of the Tanana River drainage. Commercial harvests in the Fairbanks area are primarily for summer chum and chinook salmon, the later timing of coho salmon cause them to be caught incidentally. In the event of a poor run of fall chum salmon, Commercial Fisheries Division may direct the fishery toward the harvest of coho salmon. The Tanana River from its confluence of the Gerstle River to the Little Delta River is crucial habitat for returning fall chum salmon. Alluvial aquifers associated with porous floodplain gravels store water and stabilize winter flows in this area near Delta Junction. All the large aquifers are located on the south side of the Tanana River. Groundwater seeps into the Tanana River, provided spawning habitat for chum and coho salmon, which are the last salmon species to spawn during the year. The furthest upriver chinook spawning system is the Goodpaster River with chinook entering the river in July. Aerial survey counts on July 21, 2000 show significant numbers (2,175) of chinook salmon (Morsell, 2000). Sport Fish Division conducted a carcass survey in August to recover radio tags that were planted in chinook in the Yukon River. No radio tags were recovered from 140 carcasses inspected.

In 1999, 2% of the total Yukon River commercial summer chum salmon harvests were caught in Tanana drainage (Table 8). For all salmon species, commercial harvest in the Tanana drainage was 2.1% of the total Yukon harvest in 1998 (Table 7). Because of the emergency closure there was no fall chum or coho salmon harvested in the Tanana drainage in 1998. Limited commercial fisheries exist for freshwater species such as sheefish, burbot, northern pike and whitefish, however the majority of the freshwater harvest is from sport and subsistence use. Commercial fisheries for whitefish have been permitted in recent years but none were in 1998 (Bergstrom et al. 1999).

SUBSISTENCE AND PERSONAL USE SALMON HARVESTS

Subsistence and personal-use fisheries are allowed in most of the Tanana drainage. A subsistence permit is not required for non-salmonid species from the mouth of the Tanana River up to and including the Wood River. However, a subsistence permit is needed for northern pike in the waters of the Tolovana River upstream from its confluence with the Tanana River. Subsistence fishing is closed in the Tanana River from the eastern edge of the Salcha River upstream to the mouth of the Volkmar River on the North bank of the Tanana, and the mouth of the Johnson River on the South bank of the Tanana River. In the closed area, however, whitefish and suckers can be taken under the authority of a whitefish and sucker personal-use permit. Deadman, Jan, and Fielding lakes within the Delta area of the Tanana drainage are also closed to subsistence fishing. The Board of

Table 7.-Commercial salmon harvest in Tanana River drainage and percent of Yukon River drainage harvest in 1999 (Bergstrom et al. *In print*).

Species	1999		
	Tanana	Yukon	%
	Total	Total	Tanana
Chinook	690	69,563	1.0
Summer chum	148	29,413	0.5
Fall chum	0	20,371	0.0
Coho	0	1,601	0.0
Total	838	120,948	0.7

Table 8.-Subsistence and personal-use salmon harvest in Tanana River drainage and percent of Yukon River drainage harvest in 1999 (Borba and Hammer 2000).

Species	1999		
	Tanana	Yukon	%
	Total	Total	Tanana
Chinook	1,955	52,525	3.7
Summer chum	3,036	70,705	4.3
Fall chum	15,733	89,998	17.5
Coho	9,547	20,970	45.5
Total	30,271	234,198	12.9

Fisheries in 1994 closed the Delta River to all forms of fishing including subsistence spearing for chum carcasses, citing that the spawning area should be left undisturbed. Carcasses were used primarily for dog food. Personal-use fish can be harvested using gillnets or fish wheels only taken in this fishery within a portion of the Tanana River near Fairbanks (Borba and Hammer 2000). Proposals 180 and 181 before the BOF request to legalize dip-nets and hoop-nets as legal gear in the Personal Use Fishery. Rationale for these proposals is to release non-targeted species unharmed. There is support by the department and public for these proposals.

Upstream of the Volkmar River (N. side of the Tanana) and the Johnson River (S. bank of the Tanana River), a subsistence permit is required for non-salmonid species in the remainder of the Tanana drainage. Even though a permit is required, subsistence fisheries that target non-salmon species such as pike, inconnu (sheefish), burbot, and whitefish are inadequately documented (Bergstrom et al. 1992). The permit requirement was little known to fishermen in villages along the upper Tanana River and not enforced as of 1988 (Marcotte 1991). In 1987-1988, the harvest of non-salmon fish species accounted for 33.8% of the total edible pounds of fish and wildlife resources in Dot Lake, Tanacross, Tok, Tetlin, and Northway. Household harvests of non-

salmon species ranged from about 100-500 pounds. The majority of the non-salmon subsistence harvest is made up of whitefish and pike (Marcotte 1991). Apparently, this knowledge of unreported catches in the upper Tanana River drainage, prompted proposal 165 before the BOF in 2001. The proposals intent is to repeal the requirement to report non-salmon species caught in the subsistence fishery and only report salmon. The department's position is that subsistence permits are required regardless of what species are caught. The department acknowledges there are problems with the reporting requirement, however without a permit and, therefore, no harvest information – the department's ability to detect changes in stock status and trends is virtually nil.

The Division of Commercial Fisheries documents subsistence and personal-use harvests for salmon. Poor returns in 1999 of summer and fall chums and coho salmon had a significant impact on subsistence and personal-use needs in the Yukon River drainage (Borba and Hammer 2000). Both the 1999 summer chum and coho salmon harvest were 27% below their recent five-year averages. The fall chum salmon harvest was 17% below the recent five-year average, however, the previous five-year average (more reflective of a normal average) suggests the 1999 fall chum salmon harvest is close to 37% below normal (Borba 2000). On September 20, an emergency order was put into effect to close Personal Use fishing in District 6C while allowing the Subsistence fishery to continue. The Personal Use emergency order was extended to October 4 to allow more escapement to the spawning grounds. Personal Use harvest in the Tanana River is only 0.5% of the combined Subsistence and Personal Use fisheries from the Yukon River (Borba and Hammer 2000). In 1999, subsistence and personal-use caught salmon in the Tanana drainage accounted for 12.9% of the total Yukon River subsistence and personal-use harvests (Table 8). Coho salmon harvested in the Tanana drainage made up 45.5% of the total salmon harvest for these fisheries (Table 8).

ECONOMIC VALUE OF SPORT FISHERIES

An economic study of the Delta Clearwater River sport fishery was conducted in the summer of 1985. In 1985, grayling and coho salmon fishermen spent a total of about 8,700 man-days fishing in the Delta Clearwater River (Mills 1986). It was estimated that angler expenditure per fishing trip was \$113.62, and the number of fishing trips during 1985 was 5,583, for a total estimated expenditure of \$630,000 (Howe 1987). Anglers participating in the Delta Clearwater River fishery therefore expended an average of about \$75 per man-day in 1985. Since Delta area fisheries are generally remote to most of the inhabitants of the Tanana River drainage, it would be reasonable to expect an angler day of effort to cost this amount or more.

STOCKING PROGRAM INVENTORY

The growth and success of the interior Alaska stocking program has been largely due to the development of, and production from, Alaska State hatcheries, particularly the Clear Hatchery and the Fort Richardson hatchery near Anchorage. The Clear Hatchery program began in 1977 with the production of chum salmon. During the last 10 years, production of sport fish species has taken precedence over anadromous salmonids at both hatcheries (Arvey 1995). Clear Hatchery was closed in 1997, and currently, all production of stocked fish released in the AYK Region occurs at the Fort Richardson and the Elmendorf hatcheries in Anchorage. The dominant game fish stocked in the Tanana drainage is rainbow trout which is also the most harvested species in the Tanana drainage (Table 4); although, Arctic grayling comprises a larger percentage of the catch (Table 5). Other species stocked are Arctic char, Arctic grayling, lake trout, and silver salmon. In the Delta area there are 48 lakes on the stocking inventory for 1999. Quartz

Lake is the largest lake both in size (600 acres) and recreational opportunity. There were 350,000 rainbow trout, 80,000 coho salmon, and 11,000 Arctic char stocked in Quartz Lake in 1999. About half the effort at Quartz Lake is during the open water months and half during the ice-covered period (ADF&G Statewide Stocking Plan 1999). The remaining 47 lakes are considered part of the “small lakes sport fishery” and average 34 acres in size. These lakes are stocked either annually, or, in the case of the more remote lakes, every other year. During 1999, three previously unstocked lakes were surveyed to determine stocking suitability. Kenna Lake in the Jarvis Creek drainage is a suitable candidate and in November of 2000 was stocked with 500 sub-catchable lake trout. The other Lake is Dude Lake in the Delta River drainage, which has indigenous Dolly Varden present in small numbers. Dude Lake has not been included in the Statewide Stocking Plan to date, although Dude Lake is suitable lake for stocking, further consideration must be given before stocking in systems with native populations of fish. Another Lake is in the Mosquito Flats near Tok called Square Lake. A preliminary survey of this lake has not been done to date, however, the Statewide Stocking Plan calls for 1,000 fingerlings every other year.

ACCESS PROGRAM

The Wallop-Breaux amendment to the Federal Aid in Sport Fish Restoration Act mandates that at least 15% of the federal funds collected from taxes on sport fishing equipment be used by the states for the development and maintenance of boating access facilities. This mandate is fulfilled by the ADF&G Sport Fish Access Program, which consists of two parts. The first part, the boating access coordination program, involves large capital improvement projects, such as boat ramps, parking areas, fishing docks, and land acquisition, which are subject to public review under the National Environmental Policy Act. The second portion of the program is called the small access site maintenance program. The small access program is an ongoing, annually funded program. Activities include placing and maintaining signs at lake and river angling-access sites, constructing and maintaining pedestrian and off-road vehicle (ORV) trails to fishing sites and providing portable toilets, picnic tables, and trash removal at heavily used roadside sites. The program also secures permanent right-of-ways on public and private land to ensure continued public access to fishing sites, maintains access roads to boating or angling sites that might not otherwise be maintained, constructs and maintains outhouses and tent platforms at remote angling sites, provides public-use ice-fishing houses for rental at several large stocked lakes, and produces and prints publications informing anglers about fishing and boat launching opportunities. The history of major and small access projects completed in the Tanana drainage from 1988 to 1994 can be found in Burr et al. 1998.

One project finally completed in the Delta area was securing title to 37.5 acres of land, which includes the Big Delta Pond. The small access project provided money for an environmental assessment of the Big Delta Pond in 1997 and funding for a title search of the property. This pond is privately owned and the department has been stocking catchable rainbow and Arctic char since 1992. The owner offered to donate the land to the department in March of 1996. Due to various issues, mainly questions about the land title, this donation had been stalled until October 20, 2000 when DNR issued a corrective deed which was reviewed by the Attorney General's office reopened and modified the title which essentially gave the state clear title to the property. The Private land owner (Mr. And Mrs. VanRheen) and DNR have both signed the deed and it is currently in the recorders office.

No major access projects were conducted in the Delta area during the reporting period. The Tetlin National Refuge (Federal) has completed a small boat ramp project on the Chisana River that the Sport Fish Division had been considering for upgrading. They have secured funding and completed the upgrade in spring of 1999.

In February 1999, the department provided expertise to develop a rehabilitation project for three lakes on Fort Greely's Meadow's Road. The lakes (Chet, J, and Nickel) have become reintroduced with longnose suckers. The US Army paid to have a gabion structure built across the outlet of J-Lake and purchase chemicals (Rotenone) to kill fish. The gabion was completed in August of 2000.

BIOLOGICAL AND SOCIAL ISSUES IN THE DELTA AREA

Public controversy has developed over State Division of Forestry Timber Harvest Plans along the South bank of the Tanana River. The most recent Division of Forestry (DOF) 5-year plan includes six timber sales along the Tanana River from the Delta River to the Little Delta River (an approximate 30-mile reach of the Tanana River). The sales are Surprise side, Little Delta #1, Down River, Delta Creek #3, Tanana River Salvage #4, and Whitestone extension #2. These sales and previous ones have been reviewed by Alaska Department of Fish and Game because they require access across anadromous waters. One of DOF objectives justifying these sales is harvesting timber stands that are rapidly being eroded away by the Tanana River (DOF Five-year plan FY1998-2002).

Since the early seventies Sport Fish Division has conducted biological studies on game fish species in this 30-mile reach. Many of the studies centered on Arctic grayling movements from Tanana River overwintering areas to Shaw creek, a spawning tributary, to summer feeding streams such as the clear spring-seeps of Richardson Clearwater River (RCR) and Clear Creek. Radio telemetry studies of fish tagged upstream in the Delta Clearwater River and other tagging studies showed that Arctic grayling from numerous stocks (i.e. Salcha, Goodpaster, and Delta Rivers) overwintered in this section as well. These studies show Arctic grayling make extensive movements and have diverse habitat requirements. The area contains a large number of spring-fed sloughs that include chum salmon spawning habitat. The Divisions of Sport Fish, Commercial Fish, and Habitat have been opposed to issuing a Title 16 permit to allow road building in the area without guarantees of spawning habitat protection. The Division of Habitat identified tannic runoff and ground water habitats to the Tanana River as very important for juvenile fish (Hemming and Morris 1999). The Habitat Division plans to continue juvenile studies in five habitat types in 1999 and 2000 and publish result in 2001. The goal of this study is to identify habitats used by juvenile fish and to describe the physical and water quality characteristics of these areas. Water samples are analyzed for turbidity and total suspended solids. This work has been expanded to include a sample area near Delta Junction, and continued sampling in the Tanana River near Fairbanks. This research is partially funded by Department Environmental Conservation (DEC) 319 grants, requiring a 40% match of Department of Fish and Game general fund money.

Gold exploration has lead to the development of large-scale mining operations in the Tanana drainage. The Pogo mine in the Upper Goodpaster River is a world-class mineral resource development. The Pogo mine site on the Goodpaster River includes nearly 200 square miles of claims. The areas surrounding these claims are watersheds that influence important fish streams, and the Division is concerned about water quality issues and access to this large mine. After

investigations in the summer of 2000, Teck has narrowed down an access route, from the Richardson Highway to Rosa Creek, following the Shaw Creek hillsides, and then crossing Shaw Creek. The EIS is still in progress. Starting in 1998, TECK Corporation, developers of the mine site funded (\$11,500) a long-term population study on spawning Arctic grayling in the lower Goodpaster River.

There are a number of management concerns regarding the federal takeover of subsistence management of fisheries in the state. These include enforceability of dual sets of regulations, public confusion over jurisdiction, potential increases in subsistence harvests related to customary trade, loss of sport fishing opportunity, and the lack of mechanisms for cooperative management of stocks supporting both subsistence and sport harvests. In October 1998, the federal take-over of subsistence management for fisheries had been delayed through an agreement between the Alaskan delegation and Secretary Babbitt. This prevented any take-over on navigable water until at least October 1, 1999. The Alaska Legislature did not approve a constitutional amendment for referendum in 2000, requiring a rural preference for subsistence. As of January 2000 federal takeover of fisheries on Federal lands began.

INFORMATION AND EDUCATION PROGRAM

The Sport Fish Division has provided information and education services to anglers, educators, interest groups, and the general public since statehood. In Delta, technician David Davenport organized the office effectively giving the public every opportunity to retrieve information on sport fisheries. Information provided includes a large wall map of the area with lakes and access areas marked, pamphlets, brochures, and maps. The Area Management Biologist (AMB) provides several annual aquatic education opportunities for the school district. For example, field trips to the Delta Clearwater River to examine water quality and fish habitat have been an annual event for the 7th grade class since 1988. Another example involved classrooms from Fairbanks and Tok who participated in collecting coho eggs from the Delta Clearwater River. The Coho eggs are raised and hatched in classroom incubators. A fish transport permit (FTP) is required for collection and return of these fish to the Delta Clearwater River. Lastly, at least one classroom presentation is given annually to the school district or community college.

SECTION II: DELTA AREA RECREATIONAL EFFORT

The Statewide Harvest Survey (SWHS) estimates the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as the catch and harvest of important sport species. The survey is designed to provide estimates of effort and harvest on a site-by-site basis; however, it does not provide estimates of effort directed towards a particular species. In 1999, a total of 160,427 angler-days were reported for the Tanana drainage statistical area "U" (Table 1). Of the Tanana drainage total, 38,103 angler-days of effort were reported in the Delta area (Table 3). This estimate was obtained by sorting all waters reported in the Tanana drainage by Fairbanks and Delta management areas (Appendix A1). The Delta area has 29% of the total Tanana River drainage effort (Table 3). It is estimated that 30,833 anglers fished the Tanana River drainage in 1999 and 31% fished the Delta Area (Table 2). In 1999, anglers took a total of 94,996 trips in the Tanana drainage and 24% (22,839) of those trips were in the Delta Area (Table 3). Even though more anglers take fewer trips into the Delta area, they are successful in harvesting fish since nearly half (46%) the total Tanana drainage harvest comes from the Delta Area (Table 4). Effort data between the two management areas has only been

extracted since 1997 (Table 3). Effort for the Delta Area in 1998 was 31,411 (Table 2) and increased to 46,809 in 1999.

SECTION III: COHO SALMON-DELTA CLEARWATER

BACKGROUND AND HISTORICAL PERSPECTIVE

The Delta Clearwater River (DCR) is the largest of several spring-fed tributaries to the Tanana River and supports the largest documented spawning run of coho salmon in the Yukon River (Parker 1991). The DCR is about 20 miles in length, is, road assessable (Figure 5), and provides a recreational fishery for coho salmon (ADF&G 1993). Effort estimates for coho salmon are not available from the SWHS. However, effort estimates from creel surveys of Arctic grayling during the summer subtracted from the annual SWHS indicate that 47% of the effort is being directed on coho salmon. Recent data from mail out surveys conducted in 1994 and 1995 indicate that 82% and 79% respectively, of the effort for the Delta Clearwater is directed at the Arctic grayling (P. Merritt, Alaska Department of Fish and Game, Fairbanks, personal communication). In 1999, an estimated 1,369 angler-days are aimed at the DCR coho salmon fishery (Table 9).

An average of 70% of coho salmon harvested in the Tanana drainage are from the DCR (ADF&G 1993). Coho salmon are the last of the salmon species to enter the Yukon River and begin to enter the DCR in mid-September. The peak of the run is by mid-October. Property owners living near the spring have reported coho salmon spawning as late as January. The spring provides favorable over-wintering habitat for coho salmon that rear in the river for 1-3 years. Before reaching the DCR, coho salmon travel about 1,700 km from the ocean and pass through six different commercial fishing districts in the Yukon and Tanana rivers (Parker 1991). Subsistence and personal-use fishing also occurs in each district. Escapement counts are completed on 17.5 miles of navigable water from an elevated platform on a riverboat. Aerial surveys have also been used to estimate escapement into non-boatable portions of the river from 1995 to 1998 (Stubby 1999). Preliminary counts are made in September, and if it appears that the escapement goal may not be met, the sport fish bag limit is reduced or the fishery is closed by emergency order. The present bag limit is three coho salmon per day and three in possession. This is the last open-water fishery of the year attracting both local and non-local anglers who are new to the area and want the opportunity to catch a salmon (ADF&G 1993). Anglers' fish from shore or by boat near the State Park campground and boat launch at river mile 8.5. Coho salmon are caught from mid-September through October with rod and reel using various spoons, or large spinners. Only 0.5% of the total escapement was harvested in 1999 (Table 9).

RECENT FISHERY PERFORMANCE

The coho salmon fishery on the DCR is relatively new, growing in popularity since 1984. The Biological escapement goal for the DCR is 9,000 coho salmon (ADF&G 1993). As the Arctic grayling fishery declined in 1987 a growing coho fishery caused by large coho runs, buffered the decline in effort in the DCR (Table 9). Initially harvest rates were high, with exploitation up to 16% in 1990. Starting in 1992 the harvests were below 1,000. The catch rates did not decline like the harvest during this time, which demonstrated that anglers became more interested in catch rather than harvesting. The quality of the salmon flesh is not as desirable as fish caught at the mouth of the Tanana River for example, which are still bright silver. The run in 1999 was only 125 fish less than in 1998. Initial reports of strong pulses in the lower river test wheel

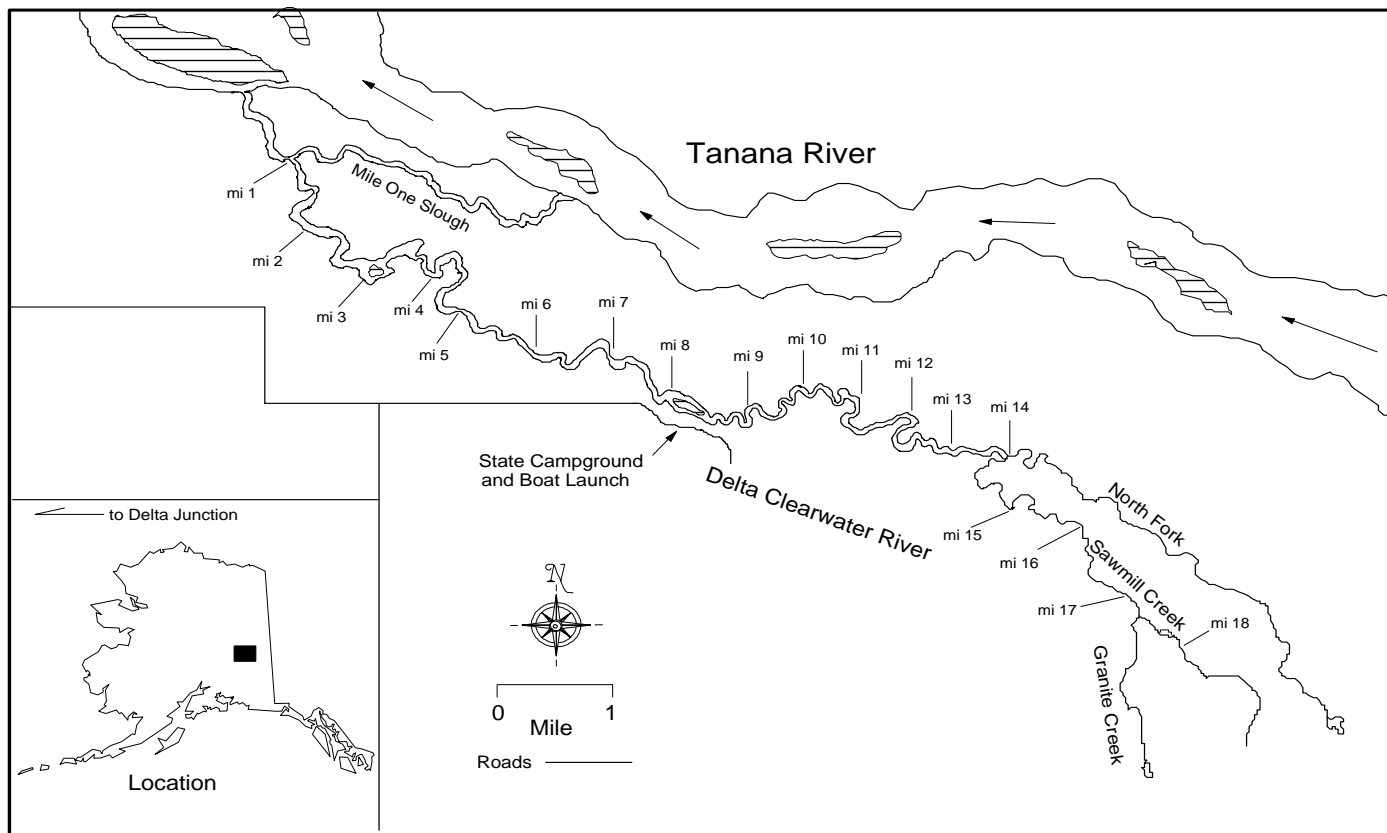


Figure 5.-Map of the Delta Clearwater River.

Table 9.-Delta Clearwater River, coho salmon escapement effort, harvest and catches from Statewide Harvest Survey ^c.

Year	Coho salmon Escapement ^a	Angler-days ^b			Harvest and		Coho Catch
		Both	Grayling	Coho	Exploitation		
1977-1981	6,214	6,280	6,159	121	45	(0.9%)	N/A
1982-1986	8,732	6,819	4,628	2,191	476	(5.8%)	N/A
1987-1991	17,745	5,279	2,717	2,563	1,301	(8.6%)	3,827
1992-1996	22,337	4,467	2,892	1,575	514	(4.8%)	2,888
1997	11,525	2,161	1,642	519	794	(6.2%)	4,174
1998	11,110	3,415	2,595	820	479	(4.3%)	2,350
1999	10,975	5,705	4,336	1,369	75	(0.55%)	1,634
2000	9,225						
Average 1977- 1999	13,535	5,457	3,937	1,520	567	(4.2%)	4,032

^a Estimates of escapement from river boat surveys only.

^b ADF&G Coho Management Plan Delta Clearwater River.

^c Mills 1979-1994; Howe et al. 1995-1999, and Howe et al. *In print*.

catches gave early confidence that the escapement goal would be met, as it turns out the 1999 escapement of 10,975 (Table 9) was above the escapement objective. The escapement for 2000 was 9,225, also above the escapement goal (Table 9).

Aerial counts for coho salmon in the non-navigable portions of the DCR were conducted from 1994 - 1998. These counts comprised 21.9%, 23.8%, 19%, 17.1%, and 20.0% (averaging 21.3%) of the expanded escapement respectively (Evenson 1995-1997 and Stuby et al. 1998, Stuby 1999). Expanded coho salmon escapement (including aerial survey of springs) for the DCR from 1994 to 1999 were 80,240, 26,383, 17,370, 13,900, 13,875, and 13,942 (Table 10). The Aerial count for 1998 will be the last expanded count survey. The average expansion proportion of 21.3% (Table 10) will be applied to future boat counts for an expanded total escapement count.

Average total escapement (expanded count) since 1977 has been 17,194 (Table 11). Large escapements during the past 5 years can be attributed to above average run strength or below average harvests in the commercial and personal-use fisheries during these years and large parent-year escapements (Table 11, Bergstrom et al. *In print*, and Borba and Hamner, 2000).

Table 10.-Boat surveys and aerial surveys of the non-navigatable portion of the Delta Clearwater River for 1994-1998 and expanded counts for 1999-2000.

Year	Boat Count	Aerial Count	Total	Percent in
	Escapement	Tributaries	Count	Tributaries
1994	62,675	17,565	80,240	21.9%
1995	20,100	6,283	26,383	23.8%
1996	14,070	3,300	17,370	19.0%
1997	11,525	2,375	13,900	17.1%
1998	11,100	2,775	13,875	20.0%
1999	10,925	2,967 ^a	13,942	21.3%
2000	9,225	2,494 ^a	11,719	21.3%
1994-2000	19,953	5,394 ^a	25,347	21.3%

^a expansion factor of 21.3% applied to boat escapement for this count.

Table 11.-Commercial, subsistence, personal-use, and sport fish coho salmon harvests for the Tanana and Yukon rivers for 1999.

Year	Commercial Fish		Subsistence/ Personal Use		Tanana Sport	Tanana Total	Yukon Total	DCR Coho
	Yukon	Tanana	Yukon	Tanana	Harvests	Harvests	Harvests	Escapement ^a
1999	1,601	0	20,970	9,547	451	9,998	23,022	13,942 ^b
Average 1977-99	35,934	4,725	31,584	13,865	844	18,778	68,361	17,053 ^c

^a Expanded count to include non-navigable portions of the river.

^b Actual expanded count using the aerial survey data.

^c Apply average expanded counts (21.3%) to all boat counts since 1977 having no expansion surveys.

MANAGEMENT OBJECTIVES

Escapement estimates of coho salmon in the DCR have steadily increased since 1972. In 1993, ADF&G set an escapement goal of 9,000 for the DCR based on the average historical boat survey escapements from 1972 to 1992 (ADF&G 1993). At that time the estimates of escapement were based upon boat counts on the navigable portion of the river (17.5 miles). Applying the average spring tributary contribution (21.3%) to boat counts since 1972, the expanded count (total count), for the DCR escapement goal is 10,450 fish.

The department plans to monitor the escapement between mid-September and early October to make an in-season projection. The projection is based upon 1/3 (3,000) of the escapement goal being in the lower eight miles of river (Figure 5). If the escapement goal will not be met, the department will close the fishery to the retention of coho salmon. In addition, the department objective is for 3,000 angler-days per year targeted on coho salmon.

FISHERY MANAGEMENT

There is room for some expansion in this fishery, as harvest rates are low and more anglers are starting to practice catch-and-release. The 1999 escapement was similar to 1998 in that the run was two weeks later than normal. Factors involved may be low Tanana River flows or elevated temperatures in the Yukon River. Low numbers in mid-September would normally have meant an Emergency Order to close the fishery to harvest. However, the test wheels in the lower Tanana River indicated a average run would occur. Due to the strong indicator, management action was postponed and the escapement goal was met without restrictive action.

FISHERY OUTLOOK

In 2000, the run timing was normal. Peak escapement count was 9,225 fish in the navigable portion of the river. The expanded count was 11,719, about 1,200 fish less than in 1999.

BOARD OF FISHERY ACTIONS

Currently, there is no management plan allowing directed coho salmon commercial fishing in the Yukon-Northern Area. The fall season is managed based on the timing and stock status of fall chum salmon. The Board of Fisheries recently (December 1997) had three proposals to establish a coho salmon Management Plan for the Yukon River. The management plan would allow a directed commercial fishery on coho salmon if a harvestable surplus were available. The Board tabled the proposal and directed Yukon River Drainage Fisheries Association (YRDFA) to draft a management plan and bring it before the Board. Before the BOF in 2000 is a YRDFA proposal (166) to reauthorize the Yukon River Coho Salmon Management Plan, indicating that if it wasn't reauthorized the plan would sunset after January 1, 2001.

CURRENT ISSUES

The previous escapement goal of 9,000 fish was based upon counts made from a boat in the main channel of the DCR. The recent addition of aerial counts suggests changing the escapement goal to 10,400.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Stock composition of coho salmon harvested in down-river fisheries is unknown. Harvests of coho salmon in the Yukon and Tanana rivers are fairly large in comparison to the documented escapement levels in the DCR and other coho salmon streams. It is believed that exploitation levels on these stocks are substantial. In the Tanana River fishery (sport, commercial, subsistence, and personal-use) alone, harvests average 110% of the DCR escapement (1977-1999; Table 12). Aerial surveys of other important coho salmon producing streams in the area should be conducted, for example, on the Richardson Clearwater River, to establish baseline information in this region. An estimated 2,175 Coho salmon were counted on the Richardson Clearwater River by aerial survey in September 2000.

Table 12.-Tanana and Yukon rivers coho salmon fishery averages and percent of DCR escapement.

Years	DCR	Tanana River		Yukon River	
	Coho	All	% of DCR	All	% of DCR
	Escapement	Harvests ^a	Escapement	Harvests ¹	Escapement
1977-1981	7,894	6,953	93%	38,055	509%
1982-1986	11,093	18,196	173%	83,165	791%
1987-1991	22,543	34,387	161%	114,802	538%
1992-1996	28,569	20,782	73%	57,867	204%
1997	13,900	13,283	96%	60,953	438%
1998	13,875	7,481	54%	18,893	136%
1999	13,942	9,547	68%	23,022	165%
1977-1999	17,053	18,778	110%	68,361	401%

^a Includes commercial, subsistence, personal-use and sport caught fish.

SECTION IV: ARCTIC GRAYLING – DELTA CLEARWATER

BACKGROUND AND HISTORICAL PERSPECTIVE

The Delta Clearwater River (DCR) is the largest of several spring-fed streams near Delta Junction (Figure 5). These clear springs are cool in the summer and provide ideal habitat for adult Arctic grayling. In rapid runoff rivers such as the Goodpaster River, grayling spawn during the early spring. When spawning is complete, some adults leave for summer feeding waters such as the DCR. Grayling, however, are not known to spawn in the DCR. It is unclear how grayling recruit to spring-fed systems, however fidelity to the spring systems is strong. The abundance of grayling populations within donor streams will determine how many fish migrate to spring systems. The majority of the DCR Arctic grayling population is predominately fish age 5 and older. Based upon catch-at-age estimates of abundance, the DCR grayling population declined for nearly 12 years from 1984 – 1996. It has increased, likely as a result of restrictive regulations (Figure 6).

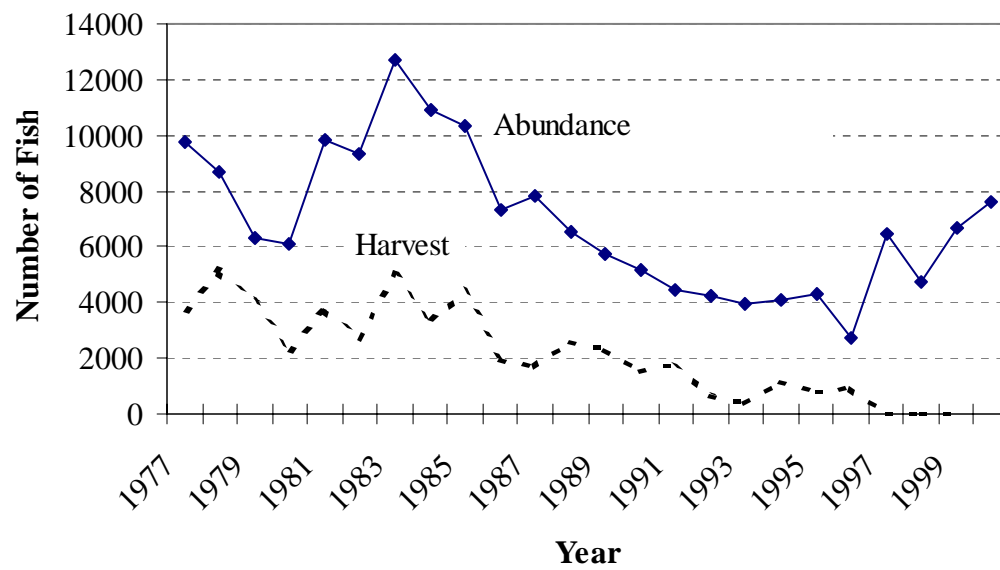


Figure 6.-Abundance of age-5 Arctic grayling in the Delta Clearwater River from 1977-2000¹.

¹ Mills 1978-1994, Howe et al. 1995-1999, and Howe et al. *In print*.

Numbers of grayling (age 5 and greater) averaged 8,600 from 1977-1989. Abundance continued to decrease through 1996 (Figure 6) to 2,750 fish in 1996 (Ridder 1998a). The preliminary population estimate for age-5 and older grayling in 2000 is about 7,634 fish (Gryska *In prep.*)

Though the DCR population appear healthy to anglers, its population has slowly decreased over time until recently. The recent increase in the population and the increase in average size has helped to create a trophy fishery. In 1998 and 1999, the catch rate was 16,100 and 11,772 respectively, which are the highest since catch rates were reported by the SWHS in 1990 (Howe et al. *In print*).

Although this fishery has become a trophy fishery, to some extent, there is a proportion of anglers that want to harvest grayling from the DCR. However, it is uncertain how harvest may affect parent stocks. Studies indicate that about 60% of the grayling originate from the Goodpaster River.

Average exploitation on the DCR grayling population from 1977 through 1990 was 37.6% (Clark 1994), which appeared to be sustainable from 1977-1989. As populations of grayling fluctuated within the Tanana River drainage, the harvest rate in the DCR likely exceeded sustainability due to fluctuations in abundance of grayling from up to eight nearby rivers. Therefore, a sustainable level of harvest should not be allowed above 20% for the DCR, which maybe equivalent to a 20% harvest rate of each contributing population or even higher on some streams. In 1995 and 1996, the bag and possession limit was reduced to two fish by emergency order, resulting in an exploitation rate of 25%. However, the population continued to decline. In 1997, an emergency order was issued for catch-and-release angling only. The BOF implemented a catch-and-release only regulation in 1997.

RECENT FISHERY PERFORMANCE

Angler effort declined in the DCR as the grayling population declined. Angler effort from 1977-1986, averaged 6,500 angler days, a majority targeted Arctic grayling (Ridder 1999). From 1992-1996 angler effort targeting grayling declined to an average of 2,892 days (Table 13). In 1999 effort (4,336 days) is near the 1982-1986 level and may continue to increase (Table 13). The proportion of angling effort has also changed in recent years from data collected from mail out surveys indicating that 76% of the annual reported effort is attributed to angling for Arctic grayling.

No reported harvest occurred in 1999 under the catch-and-release regulations for the DCR (Table 13). Grayling catch rates averaged 6,357 grayling from 1992-1996 and 11,918 were caught in 1999 (Table 13), which is higher than the 1990-1999 average of 8,905.

MANAGEMENT OBJECTIVES

Since the DCR is an aggregate of several stocks, the fishery will be managed on a conservative yield basis. Whereas, the biological objectives are to: 1) maintain historical stock levels, and, 2) maintain historical size and age composition. Under the current management plan implemented in 1993, the objective is to provide 3,000 angler-days of effort, a harvest of 3,000 fish and a catch rate of two fish per day. This management plan needs to be revised to reflect that a 3,000 fish harvest is not sustainable. Comments from

Table 13.-Number of Arctic grayling harvested and caught by recreational anglers fishing the Delta Clearwater River from 1977-1999 ^a

Years	Average DCR effort	Average grayling effort	Average grayling harvest	Average grayling catches
1977-1981	6,280	6,159	6,662	na
1982-1986	6,819	4,628	4,734	na
1987-1991	5,279	2,717	2,374	11,021
1992-1996	4,467	2,892	958	6,357
1997	2,161	1,642	0	4,665
1998	3,415	2,595	0	16,135
1999	5,705	4,336	0	11,918
1977-1998	5,457	3,937	3,202	8,905

^a Mills 1978-1994, Howe et al. 1995-1999 and Howe et al. *In print*.

several public meetings during 2000 indicate that the public want the department to manage the DCR for large Arctic grayling. Furthermore, some level of harvest is sought.

FISHERY MANAGEMENT

Without the opportunity to harvest Arctic grayling, the DCR fishery effort and recreational opportunity experienced a decline (Parker and Viavant 2000). As a result of catch-and-release restrictions, visitors to the State campground spend fewer nights in the campground according to the local State Park Ranger (B. Ludwig, Alaska Dept. of Natural Resources, Delta, personal communication). A harvest may increase participation (angler-days), which has been increasing in recent years to historical averages (Table 13). Most anglers fishing the river are residents who know the river well and have access to a boat. More and more visitors from across Alaska have participated knowing large grayling exist, or enjoy catch-and-release only opportunities. These anglers have been enthusiastic about the quality of the fishery because of the large size and catchability.

Maximum sized fish in the population can be attained by maintaining catch-and-release regulations or by allowing harvest on smaller fish. To allow a minimum harvest level of 1,000 fish, which could only occur under a very restrictive regulations package, while the population would have to be at 5,000 fish. Once the population fell below this benchmark the fishery should be catch-and-release only.

A tagging study determined that the largest contributor of grayling (60%) to the DCR was the Goodpaster River (Ridder 1998b, Figure 5). In 1995 and 1996 the Goodpaster River (GPR) contributed 10% and 7% of its pre-migration population respectively to the DCR. In 1995 and 1996, the GPR stock exploitation in the DCR was 5.2% and 2.8% respectively. In addition, the GPR contributes fish to other fisheries and has its own grayling fishery for a total exploitation of 10.1% in 1995 and 6.4% in 1996. Both of

these exploitation levels are within sustainable limits (B. Ridder, Alaska Dept. of Fish and Game, Delta Junction, personal communication). In 1995 and 1996, harvest was low (1,000) in the DCR because of the reduced bag limit. In previous years, under more liberal regulations harvests averaged over 3,000 fish. The potential for a much higher, perhaps unsustainable, exploitation may have existed.

FISHERY OUTLOOK

Healthy numbers of recruits to the DCR were observed for the first time in four years in 1997 and 1998 (Parker and Viavant 2000), but did not continue to be a trend in 1999. A mark-recapture experiment was completed in 1999 and 2000. Results of the 1999 survey indicate a population of 7,634 fish over 270mm in fork length which was an increase of 1,944 fish over the 1998 estimate of 4,740 fish. During 2000, the population again increased by 950 fish to 7,634 fish over 270mm. The length of 270mm fork length is equivalent to a 12-inch total length fish, commonly used in Arctic grayling regulations.

Uncharacteristic of how biologists view recruitment, more larger fish appeared across several age classes increasing the population of large sized fish that inhabit the choice habitat areas. If large sized fish continue to occupy the DCR, and continue to grow in numbers, it is theorized that the capacity of the system will soon be reached, and smaller fish will be excluded (M. Wallendorf and D. Roach Alaska Department of Fish and Game, Fairbanks, personal communication). Based on per recruit analysis, sustainable harvest from the DCR can range from 11 to 22% depending on the desired population structure. If the mortality rate for small fish is greater than replacement, abundance will drop but the large-fish component could be maintained with only a few fish growing across the large-size categories. Further results of modeling work completed by the department and found in Appendix B1 and B2.

BOARD OF FISHERY ACTIONS

The BOF took action regarding this fishery at its December 1997 meeting in Fairbanks. The BOF passed amended proposal 195. The proposal changed Arctic grayling regulations in the DCR to catch-and-release only. The proposal was amended to add single-hook to the unbaited and artificial lure gear restrictions from January 1 to September 1. The non-single hook is used for the remainder of the year when the fishery targets coho salmon. Additional substitute language included the Clearwater Lake drainage with the same regulation to avoid enforcement issues.

The BOF will take action during of 2001 on 17 proposals that request some level of harvest. The department is neutral on proposals 196-213. Our neutrality is based upon competing consumptive and non-consumptive uses of Arctic grayling on the DCR. If non-consumptive harvest is considered no regulation change is required. If consumptive harvest is entertained then the department opposes proposals 196-213 with the exception of amended proposal 212. The Delta Fish and Game Advisory Committee has amended their proposal (212) to include: A one fish daily bag and possession limit. The open season for Arctic grayling is July 1-July 31, catch-and-release only from August 1-June 30. The maximum size limit of Arctic grayling is 12 inches (total length) or less. The department also recommends that hook (un-baited, single hook, artificial lures from January 1-August 31; and un-baited, artificial lures be used from September 1-December

31) and area requirements, (including Clearwater Lake drainage, Figure 7) already required, remain the same.

CURRENT ISSUES

Questions about enforcement have been raised from the public who feel that violations will increase when harvest is allowed with restrictive bag, size, and season limits.

The department has received input from individuals desiring harvest and those wanting to see catch and release regulations continue. The BOF has also received many of the same comments both through submitted proposals and public testimony; they will decide how the fishery should proceed. The common desire is that large fish are maintained.

Catch rates are very high in the DCR nearly 12,000 in 1999 and over 16,000 in 1998 as reported in the SWHS (Table 13). This would equate to each fish in the river having been caught twice. The high catch is probably responsible for some level of mortality although low (McKinley 1993), but even a low hooking mortality rate could be significant with such high catch rates. Because of high catchability (6 fish per day in 1998, Table 13), opening the fishery to harvest will have to be limited.

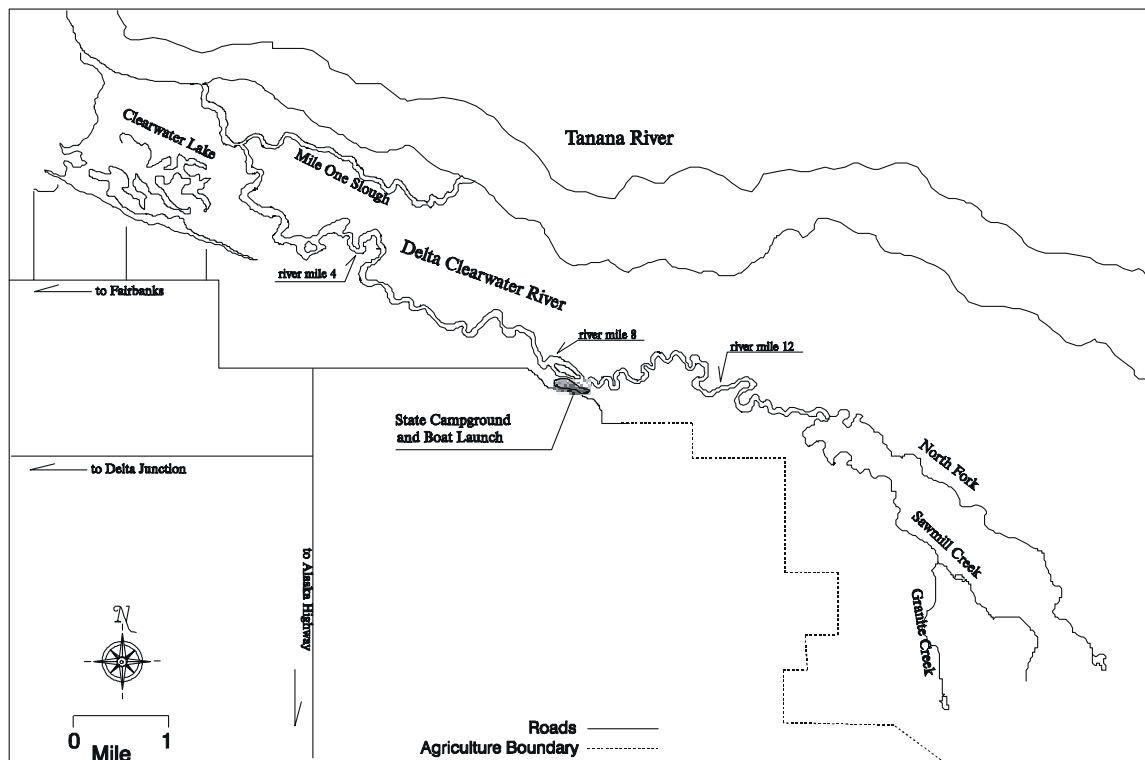


Figure 7.-Map of Delta Clearwater River and Clearwater Lake, all included in special catch-and-release waters regulations made by BOF in 1997.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Estimates of abundance of the DCR should continue to assess the management objective to provide large fish in the population. In addition, if the BOF allows harvest to occur in 2001, then evaluation of the new harvest regulation should be monitored.

Alternatively a snorkeling method for estimating abundance in the DCR can be used in a substantial savings in cost and manpower (Parker 2000a). The snorkeling method is 33% of the abundance obtained by the mark-recapture method (Parker 2000a).

Management activities will continue to ensure protection of aquatic habitat for healthy fish production. Starting in 1999, the National Resource Conservation Service (NRCS) will begin implementing a watershed project that will prevent sediment-bearing waters from the Granite Mountains from entering the DCR. The first phase of construction was completed in the summer of 2000. Mapping of habitat area and determining a means to monitor changes to habitat are types of studies that should be implemented in the near future.

SECTION V: DELTA AREA LAKE TROUT

BACKGROUND AND HISTORICAL PERSPECTIVE

Since 1986, lake trout populations in the Upper Tanana drainage have declined and restrictive regulations exist on many area lakes. Specific life history features (slow growth, delayed maturity and non-consecutive spawning) combined with the short growing season at higher altitudes increase the vulnerability of the species to overharvest (Burr 1987). The impact of even modest fishing pressure can be significant. Lakes containing lake trout in the Delta area include Fielding, Two Bit, Landmark Gap, Glacier, Sevenmile, and the Tangle lakes. In addition, lake trout are transplanted in several Delta Area lakes: Chet, Crystal Lake #2, Ghost, Nickel, and North Twin Lakes along the Meadows Road (Fort Greely); Paul's Pond along Coal Mine Road; and, 4-Mile Lake on the Taylor Highway.

Lake trout typically inhabit deep, oligotrophic mountain lakes while moving into shallow rocky shoals to spawn in late fall. Lake trout spawn for the first time at ages ranging from 5 to 12 years of age, depending on growth conditions. Alternate year spawning may be more normal than spawning in concurrent years in interior and northern Alaska.

RECENT FISHERY PERFORMANCE

Tanana River drainage lake trout harvest in 1999 was 11% of the statewide harvest (Howe et al. *In print*). In 1999, 71% of the Tanana drainage lake trout harvest occurred in the Delta area (Table 4). The Tanana River drainage harvests in 1999 (1,145) nearly doubled from 1998 and is comparable to 1992-1996 five-year average (1,211, Table 14). This is in part due to increasing catches in the Tangle Lake system and to the stocking effort in small lakes in the Delta Area that were stocked in the early 1990's and are now producing catchable size fish. The average catch rate has been very consistent since 1990 (Table 14). An average of 42% of the lake trout harvested since 1977 in the Tanana drainage came from the Tangle Lakes (Table 14).

Table 14.-Summary of sport harvest and catch^a of lake trout in the Tanana River drainage^b.

Year Harvest	Harding Lake	Fielding Lake	Tangle Lake ^c	Delta River	Stocked lakes/ponds	other	Total
1997	77	51	196	0	127	279	730
1998	50	21	320	0	105	174	670
1999	89	43	484	14	14	501	1,145
1977-81	Na ^d	295	628	na	na	680	1,201
1982-86	24	258	1,322	234	24	376	2,368
1987-91	90	233	328	40	527	305	1,536
1992-96	139	116	337	3	386	204	1,211
1977-1999	100	181	625	33	309	382	1,484
Catch ^a							
1997	245	245	1,466	0	402	959	3,317
1998	351	341	1,349	0	765	789	3,595
1999	807	279	2,034	81	298	967	4,466
1995-99	443	315	1,601	28	515	916	3,818
1990-99	379	416	1,503	38	831	1,062	4,217

^a Information available from 1990-1997 only. Anglers may have harvested or released fish tallied as "catch."

^b Includes Tangle River.

^c Mills 1978-1994, Howe et al. 1995-1999 and Howe et al. *In print*.

^d No reported Harvest.

MANAGEMENT OBJECTIVES

Lake trout fisheries such as Fielding Lake are managed based upon a harvest guideline to prevent excessive harvest and allow recovery of heavily fished populations. The current harvest guideline is to prevent harvest levels from exceeding 0.5 kilogram per hectare annually.

FISHERY MANAGEMENT

Management actions using a guideline of 0.5 Kg/ha/yr have been successful in regulating harvest to an acceptable level (Burr 1993). In 1987 new regulations restricted the daily bag and possession limit to two fish per day with no size limit. However, in Fielding Lake, harvests averaged 230 fish per year from 1987-1991, when harvests according to the guideline should have been 80 fish. In 1993 the bag and possession limit was reduced to one fish by emergency order and the size limit raised to 22 inches. This effectively

dropped the harvest levels. From 1994 to 1999 harvest dropped to a sustainable average harvest of 41 lake trout annually (Table 14). In 1999, the harvest of 43 lake trout (Table 14) in Fielding Lake was within the guideline of about 80 fish per year. However, biologists suspected that the population had dropped to such a low level that harvests would be reduced. Research has been conducted on the spawning population over the past three years. It is estimated that the spawning population is 360 fish. Female lake trout in Fielding Lake reach sexual maturity at an average age of eight years old and at an average length of 21 inches (Burr 1991). An increase in the minimum size limit to 26 inches would allow half of the female lake trout in the spawning population to escape harvest (Figure 8).

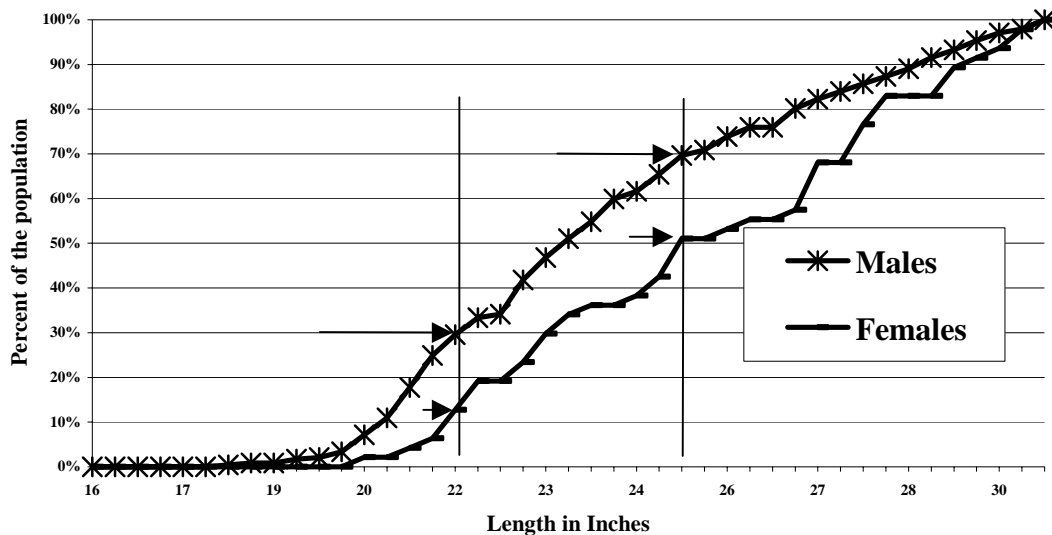


Figure 8.-Percent of the population by size of male and female spawning lake trout captured at Fielding Lake from 1998-2000.

Stocking of lake trout into small roadside lakes in the Tanana drainage has been successful in higher elevation lakes and has added diversity to the stocking program. Lakes stocked along the Meadows Road and Coal Mine Road, South of Delta Junction, and 4-mile lake along the Taylor Highway, have healthy populations of lake trout (Burr 1994).

FISHERY OUTLOOK

In 1998, a three-year research project started in Fielding Lake to estimate the population of lake trout. In September of 1998-2000, 96, 92, and 104 fish respectively were captured with a seine on the only spawning bed observed. The Jolly-Seber population estimate for males was 180. The number of males is doubled for a total population estimate of 360 fish.

In Sevenmile Lake a lake trout egg-take was conducted in 1999 collecting ~ 83,000 eggs (Parker 2000a), removing about 12% of the annual production (Parker and Wuttig, *In print*). A mark-recapture experiment was also conducted to determine if initial egg take removal in 1993 is having an effect on the population. In 1999, the population of lake trout was estimated at 1,260 (SE =185). The estimated abundance in 1999 was not significantly different than abundance found in Sevenmile Lake 10 years earlier (Parker and Wuttig, *In print*). Egg-production lost to egg-takes is not having a impact to the population.

BOARD OF FISHERY ACTIONS

The Board of Fisheries approved restrictive bag limits throughout the Tanana River drainage in 1987. The Board restricted the daily bag and possession limit to two fish per day with no size limit. With continued intense fishing pressure at Fielding, Harding, and Tangle lakes, it was necessary to add additional restrictions. These regulations required lake trout harvested in Fielding and Tangle lakes to equal or exceed 18 inches in total length. Continued high harvest of lake trout in the Tangle Lakes caused a reduction in the daily bag and possession limit to one fish per day and a minimum length limit of 18 inches. Another change to reduce harvest occurred on Fielding and Harding lakes July 1, 1993, when the minimum size limit was changed by emergency regulation from 18 to 22 inches on Fielding and a length limit of 18 inches was established for Harding Lake. This regulation was effective in reducing the harvest in Fielding Lake from 276 in 1993, to an average of 41 from 1994-1998 (Table 14). No formal board action has occurred since changes were made in 1987.

The BOF will be considering raising the minimum size limit to 25 inches and establishing a spawning closure for Fielding Lake (proposal 195) during the January 2001 meeting. The department will support proposal 195, asking the BOF to increase the limit to 26 inches to protect half of the female population and establish a spawning closure for the month of September.

CURRENT ISSUES

More anglers are discovering the single spawning bed at Fielding Lake. Other lakes such as Round Tangle Lake have a single spawning area and are susceptible to exploitation (J. Burr, Alaska Department of Fish and Game, Fairbanks, personal communication). Populations such as Fielding and the Tangle Lakes in the Delta Area need protection during spawning when lake trout are extremely susceptible to fishing.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Lake trout research on Fielding Lake was concluded in September 2000. The estimated number of spawning lake trout was 360. Future research should be directed at obtaining an estimate of the spawning population at Tangle Lakes.

SECTION VI: TANANA RIVER BURBOT

BACKGROUND AND HISTORICAL PERSPECTIVE

People residing within the Delta area are the primary participants in this year-round fishery. Most fishing occurs during the spring and summer in the upper Tanana River drainage, unlike the winter fishery in the Fairbanks area. In past years, the most heavily

fished lakes were Fielding, Harding, and Tangle lakes. Since 1987, bag limits in these lakes were reduced to two fish daily, and the use of setlines was eliminated. Burbot stocks in the Tanana River are exploited most heavily near population centers such as Fairbanks, Delta Junction, and near Northway. Burbot movements within the Tanana River tend to minimize effects of concentrated local fishing effort, and stocks in the Tanana River appear to be lightly exploited (Evenson 1997).

RECENT FISHERY PERFORMANCE

The 1999 estimated harvest of burbot in the Tanana River drainage by sport anglers was 3,148, about 1,300 fish below the 23-year average (Table 15). The estimated average harvest of burbot in the Tanana River drainage during 1998 is about 1,300 fish below the 22-year average (Table 15). In 1999, 46% of the burbot harvest came from the Tanana River. The Tanana River is split into three statistical areas; Lower, middle, and upper Tanana River. In 1999, 101 burbot were caught in the lower section, 2,511 caught in the middle section and 241 in the upper section (Howe et al. *In print*). The middle section is in both the Fairbanks and Delta areas. It was estimated based on the relative size of the respective fisheries that about 70% of the burbot harvest is taken in the Fairbanks area while 30% occurs in the Delta area (Parker and Viavant 2000). In 1999, the burbot harvest in the Delta area was 877 or 28% of the total Burbot harvest in the Tanana River (Table 6).

Harvest from area lakes has declined since 1987 when restrictions on number of hooks, set lines, and seasons for many lakes were enacted. From 1981-1984 harvests of burbot at Fielding Lake averaged 330 per year and caused a crash of the adult population. Due to low recruitment, a cycle of high and low abundance has occurred thereafter (Parker 2000b). In 1994 the department issued an EO to close the taking of burbot until further notice. Only recently has the population stabilized and in the future there may be opportunity to fish burbot in Fielding Lake (Parker 2000b). The only reported harvest in 1999 from a lake population of burbot is Tangle Lake in the Delta Area.

The average 23-year harvest in the Tanana River drainage is 88% (Table 15) of the mean catch, indicating the consumptive nature of this fishery.

MANAGEMENT OBJECTIVES

The Management objective for the Tanana River and Tanana drainage lakes is to ensure harvests and incidental mortality of burbot are less than 10% of the population size. Lake burbot populations, particularly in the Delta Area, have very restrictive regulations to prevent overharvest.

FISHERY MANAGEMENT

Stock assessment of lake-dwelling burbot occurred in Fielding Lake (Parker 2000b). Even though little harvest of burbot was reported in 1999 for other lakes in the Delta area, some low-level harvest occurs by individuals living in the vicinity. Sustainable levels of harvest in small high elevation lakes such as Fielding and the Tangle Lakes are thought to be low and if harvests should reach 100 fish per year, impacts upon the population should be investigated.

Table 15.-Sport harvest and catch of burbot in the Tanana River drainage^a

Harvest Year	Fielding Lake	Tangle Lake ^c	George Lake	Shaw Creek	Tanana River	Other	Fairbanks	
							Waters ^d	Total
1997	0	42	52	0	2,193	240	1,198	3,725
1998	0	0	8	71	1,792	410	1,014	3,295
1999	0	8	0	0	2,215	359	566	3,148
Averages								
1977-1981	249	146	46	NR	NR	1,234	934	2,609
1982-1986	255	80	83	237	2,214	1,109	1,935	5,913
1977-1986	253	109	69	237	2,214	1,171	1,683	5,737
1987-1991	25	20	22	294	2,095	541	827	3,823
1992-1996	31	12	85	116	2,478	423	1,174	4,319
1977-1999	87	60	58	169	2,231	763	1,081	4,449
Catch ^b								
1997	0	42	73	0	3,138	635	1,408	5,296
1998	25	0	8	79	2,630	537	1,312	4,591
1999	15	28	13	0	2,853	435	1,228	4,572
1990-1999	25	30	61	155	2,831	627	1,339	5,068
1995-1999	8	28	63	68	2,913	454	1,357	4,890

^a Mills 1978-1994, Howe et al. 1995-1999 and Howe et al. *In print*.

^b Information available from 1990-1998 only. Anglers have harvested or released fish tallied as "Catch".

^c Includes Tangle River.

^d Fairbanks waters include Harding Lake, Chatanika River, Chena River, Minto Lake and Tolovana River, Piledriver Slough, and Nenana River.

NR = no harvest or catch reported.

FISHERY OUTLOOK

Abundance and an index of abundance were estimated for burbot in Fielding Lake since 1985. In 1999, estimated abundance of fully recruited burbot (>450 mm TL) was 598 (SE = 62). The index of abundance for 2000 was 760 fish (Parker 2000b). The population currently in the lake could have a consumptive harvest.

BOARD OF FISHERY ACTIONS

In 2000, the department submitted proposal 193, to allow a one daily bag and possession limit for Fielding Lake.

CURRENT ISSUES

Exploitation rates of burbot in the Tanana River are not considered excessive. However, low abundance in most of the lakes may result in over-exploitation. Burbot stock assessments carried out by ADF&G during the late 1980's indicated that the uppermost river section near Northway supported the lowest density of large burbot among the river sections sampled (~90/km sampled, Evenson 1991). Subsistence and personal-use fisheries for burbot are known to occur in the upper Tanana, but harvests in these fisheries have been under-reported, as is suggested to the BOF in proposal 165. Although fisheries occur throughout the year, the major effort for burbot is in the spring prior to a rise in water levels caused by glacier melt. Current estimates of stock status or of harvest for the upper Tanana drainage are unavailable. However, since this part of the river showed low relative abundance of burbot compared to other river sections and has seasonally intense effort and harvest, there is concern for local depletion.

Population density of burbot in lakes declined dramatically in the early 1980's due to unsustainable rates of sport fishing exploitation. Stock assessment studies in the 1980's conducted in lakes of the upper Susitna/upper Copper River basin and the Tanana River drainage (Lafferty et al. 1992), confirmed that several lake stocks in the Tanana drainage showed evidence of high exploitation. More recent stock assessment studies conducted in lakes of the Tanana River drainage demonstrate the detrimental effects of long-term high exploitation rates (Parker 2000b).

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Ongoing population assessment of burbot in Fielding Lake is a long-term project to determine the effects of overharvest on the population. The Tanana River burbot population near the Northway area should be investigated because of seasonal depletion. Since the Department is unaware of what kind of fishery occurs on this resource, an attempt to estimate harvest from all fisheries on this stock is recommended.

SECTION VII: DELTA AREA NORTHERN PIKE

BACKGROUND AND HISTORICAL PERSPECTIVE

The major northern pike sport fisheries for the Delta Area occur in George, Volkmar and Healy lakes, and also the Goodpaster and Volkmar rivers. There are several lakes and creeks in the Tetlin National Wildlife Refuge that also have abundant pike resources but do not show up in the SWHS. There are no road accessible pike fisheries in the Delta area, and with the exception of Scottie and Moose Creek and Deadman Lake near the

Canadian Boarder, all are accessed by plane or boat, and are mostly open-water fisheries. Other lakes in the Delta Area with pike populations are Sand, "T", Mansfield, Dog, Island, Tetlin, Takomahto, Jatahmund, Island, and Wellesley Lakes. George Lake, the largest pike fishery in the Delta Area, is accessed by boat, snowmachine, and float and ski equipped airplane, and the fishery occurs year round. Volkmar Lake is accessed primarily by snowmachine, but also by float and ski equipped airplane, and the fishery there occurs primarily in the winter.

Much of the effort directed towards pike in the Tanana drainage is non-consumptive fishing. Pike harvests in 1999 represent 16.5% of the total pike catch in the Tanana drainage (Table 4). Although effort is not estimated by target species (fishery), it is felt that the majority of the effort at George and Volkmar lakes is directed toward northern pike. Lately, effort at George and Volkmar lakes has been more variable, particularly at George Lake. Low snowfall and low creek levels have prevented access to these lakes.

Stock assessment of northern pike populations in the Tanana drainage has been done during various years between 1987 and 1994. Assessments were done at George Lake from 1987 through 1991 and at Volkmar Lake from 1985 through 1994 and in 2000.

Anglers use hook-and-line gear all year to harvest northern pike. In addition, spears are used during the ice-cover months. Anglers fishing in lakes are very successful in the spring when pike have concentrated for spawning (Hallberg 1992). In 1993, 549 households responded to a northern pike survey to gather information on the distribution of participation and harvest, and kinds of gear used by successful pike anglers. Results showed that 84% of participation and 82% of the harvest occur in the open-water months (Bingham and Parker, 1995). Open-water fishing occurs slightly more on rivers (51%) than on lakes (49%).

Only 14% of the total participation occurred during the ice-covered season, of which 86% of effort was on lakes. Anglers harvested 40% of their pike using spears, which are more effective than using hand-held lines or tip-up's. Anglers reported that a small spearhead, less than 6 inches in width, may not be as efficient in harvesting pike as a spear head that is 6-10 inches (Bingham and Parker, 1995).

RECENT FISHERY PERFORMANCE

Estimated harvests for northern pike fisheries in the Tanana drainage have been highly variable over time at most locations (Table 16). However there is a declining trend in the overall harvest over the past 5 years (Table 16). Anglers would likely take more advantage of the fishery at George Lake if access improved. In recent years low creek levels and snowfall made it difficult to boat into the lake in the open water months and snowmachine during the winter. George Lake supported harvests that were consistently over 1,000 fish up until the late 1980s, but since then have ranged from 460 to 1,100 (Table 16).

Volkmar Lake is a remote lake, accessible by floatplane during the open water months. The majority of the effort occurs during the winter when anglers access the lake by snowmachine from Quartz Lake to the Goodpaster River, or by crossing the Tanana River from Sawmill Creek Road, east of Delta Junction. During the winter the fishery is characterized as consumptive, fish caught by jigging or spearing, are easily preserved by

Table 16.-Sport harvest and catch of northern pike in the Tanana River drainage^a.

Year	Harding Lake	Chena River	George Lake	Volkmar Lake	Minto Lake	Other	Total
Harvest:							
1995	502	500	531	1,084	3,126	1,532	10,620
1996	363	407	1069	Na ^b	1,278	1,349	6,618
1997	94	206	462	84	1,702	1,527	5,016
1998	271	364	603	na	1,106	1,607	4,404
1999	66	122	344	na	908	1,001	2,925
1995-1999	259	320	602	584	1,784	1,500	5,917
1977-1999	759	538	1,336	417	2,846	2,229	8,721
Catch:							
1995	3,852	1,890	1,582	1,801	21,823	7,858	53,963
1996	4,070	1,624	3,687	na	12,495	11,873	43,279
1997	2,578	1,762	2,966	598	14,712	7,995	36,221
1998	3,051	1,821	4,987	na	6,854	11,091	31,057
1999	828	921	3,380	na	3,261	9,396	17,786
1995-1999	2,876	1,604	3,320	1,200	11,833	9,643	36,461
1990-1999	3,808	1,668	3,541	1,171	14,384	11,212	42,206

^a Howe et al. 1995-1999 and Howe et al. *In print*.

^b Data not available.

freezing. A recent access improvement to the Sawmill Creek Road trail has increased recreational activity at Volkmar Lake. Anglers reported drastic declines in the pike population in Volkmar Lake that prompted a reduction in the bag and possession limit to one fish per day during the last BOF meeting.

MANAGEMENT OBJECTIVES

The department spent ten years conducting population surveys on Volkmar Lake from 1985 to 1994. According to sustained yield models, the Volkmar Lake maximum production level population is 3,000 fish (over 18 inches). The average abundance of catchable pike, or those 18 inches or greater, is 2,800. Based upon the average population size, an annual harvest between 10-20% (or 300-550 fish) is sustainable. During late 1997 the BOF reduced the bag and possession limit to one fish with no size limit. Anglers from Delta Junction testified that effort in 1996 was high but harvest was poor, with few large fish. No estimates of harvest were available for 1996 because too few Volkmar Lake anglers responded to the SWHS. The department saw no decline in the number of icehouse permits issued in 1996 (as a gauge of effort) and supported the

bag reduction proposed by a local angler as a conservation measure. The department feels that the reduction of the bag limit is sufficient (harvest of 84 in 1997; Table 16) to reduce effort and harvest to acceptable levels.

Pike fisheries (except for the Chena River) are managed under a management plan written and adopted between 1992 and 1993. The objectives in these management plans all include ensuring that northern pike harvests and incidental mortality from the recreational fishery are sustainable, and ensuring that benefits to the public derived from the recreational fisheries outweigh the costs of managing the fishery. These plans also include objectives regarding the level of participation in each fishery.

FISHERY MANAGEMENT

Estimates of catch and harvest from the SWHS for Volkmar Lake are periodic, with only six estimates in 21 years. There was an average of 417 angler days per year from 1981-1999 (Table 16). Harvest of northern pike in Volkmar Lake appeared to be sustainable up until 1994 (Parker and Viavant 2000). About 3,100 spawning-sized fish (>449 mm) were estimated in the spring of 1993 (Pearse, 1994). In 1992, the harvest was 231 fish resulting in an exploitation rate of 7%. In 1994, abundance was 2,300 over 449 mm (Hansen and Pearse, 1995) and the exploitation rate was 14% based on an estimate of 320 fish harvested in 1993. A sustainable harvest for a population of 2,000 spawners is about 300 pike. Therefore, in 1994 the population was slightly above the maximum sustainable level, with harvest slightly over the optimal level (Pearse and Hansen 1995). However, the harvest of 1,084 in 1995 is not sustainable and may have been responsible for the population decline experienced by anglers in 1996 and 1997. The harvest rate per angler-day is 0.9 for Volkmar Lake, which allows 330-550 short angler-days. At these harvest rates, it is unreasonable to provide 1,000 angler-days, which is called for in the management plan without increasing restrictions. Improved access is blamed for the recent increase in effort. In February 1994, there were 12 icehouses on the lake (the most ever recorded) and many reports to staff of increased fishing use. For management purposes, an estimate of angler-days over 600 should be of concern.

FISHERY OUTLOOK

Abundance of northern pike in Volkmar Lake was estimated in the summer of 2000. The population in George Lake is thought to be healthy; effort and harvest have been down in recent years due to difficulty in accessing the lake.

BOARD OF FISHERY ACTIONS

Due to unsustainable harvests and population declines in some fisheries, regulations for pike were restricted during the late 1980s. In 1987, the bag limit was reduced from ten per day to five per day, with only one over 30 inches. The 30-inch size limit implemented in the mid-seventies was designed to make more large fish available to anglers. In 1992, The Board of Fisheries passed a regulation that established a spring spawning closure (April 1- May 31) in the Tanana drainage. The closure was intended to protect northern pike while they are concentrated for spawning and are most vulnerable to anglers (Arvey 1995).

Several proposals relating to northern pike in the Tanana drainage were considered by the Board of Fisheries during the 1997 AYK meeting. The Board adopted the Departments

proposal (191) to remove the area-wide spring spawning closure for flowing waters (except the Tolovana drainage) and relaxed the drainage-wide spawning closure to increase the season by 20 days (moving the spring closure from April 1 to April 21), with the exception of popular fisheries such as Harding, George (including its outlet), and Volkmar lakes. The Board adopted a public proposal (supported by the Department) to reduce the bag and possession limit at Volkmar Lake from five down to one fish per day (proposal 192), but amended the proposal to continue to allow spear fishing (the original proposal was to reduce the bag limit to one fish, and to ban spear fishing).

In 2000, BOF proposal 190 deals with the Chisana River drainage upstream from the Northway bridge in which northern pike daily bag and possession limit will be reduced to two fish with only one fish over 30 inches. This proposal seeks to protect stocks of fish in streams that cross the Alaska Highway from the Boarder to Northway. The Department is supportive of the proposal. In addition, proposal 191 asks that the open season for northern pike in lakes of the Tanana River drainage be from May 20 through April 20. If adopted, this proposal will liberalize fishing opportunity during the spawning season. It would remove 12 days (May 20 through June 1) from the spring spawning closure for northern pike in lakes of the Tanana River drainage. The department does not support this proposal as it does not extend protection to stocks that do not have stable populations.

CURRENT ISSUES

The public would like ADF&G to increase the number of large fish in Volkmar Lake. Ten trophy-sized northern pike have been taken from Volkmar Lake since the inception of the ADF&G trophy program. Currently, anglers on the average harvest 60% of the population over 30 inches. The average proportion of pike (> 30 inches) harvested since 1991 is 28%, and 97% of the pike > 30 inches caught are harvested. To increase the proportion of large fish captured, more medium sized pike must be allowed to recruit. A maximum size limit of 26 inches or a slot limit up to 26 inches and over 40 inches may accomplish this objective. Anglers must concede to harvesting fewer large fish. Also spearing as a method would likely be incompatible with a slot limit. After evaluating the population in 2000, staff will likely make a recommendation for a particular harvest regulation.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

A population study of Northern pike in Volkmar Lake is necessary to determine the effects of perceived overharvest. This information will be conveyed to the BOF as updated information.

SECTION VIII: DELTA AREA STOCKED WATERS

BACKGROUND AND HISTORICAL PERSPECTIVE

The Alaska Department of Fish and Game (ADF&G) stocks game fish in 45 lakes in the Delta Area. The stocking program is designed to provide additional fishing opportunities near communities and popular recreational destinations where fish resources and angling opportunity are limited and where fishing effort and harvest are highest. Lakes in the stocking program range in size from a few acres to several hundred acres and are

accessible by road, trail, ATV or aircraft. Most of the fisheries are year-round and half of the angling effort on some lakes occurs during winter. The stocking program also generates an important conservation benefit because it diverts harvest away from wild populations.

In 1999, an estimated 9,637 anglers fished in the Delta area and they generated an estimated 46,809 angler-days of effort (Table 2). About 21,736 angler-days of effort were directed toward stocked fish in Delta area lakes (Table 17) in 1999. This represents 46% of the total estimated effort in the Delta area in 1999. The harvest and catch in these stocked lakes were estimated at 29,502 and 90,892 fish (Table 17). In 1990, harvest of stocked fish in the Delta area represented 77% of the annual harvest and 56% of the estimated annual catch (Table 4 and 17).

Today ADF&G provides diverse year-round sport fishing in the Delta area for rainbow trout, coho salmon, Arctic grayling, Arctic char, and lake trout. Goals of the fish-stocking program in Region III are:

1. Reduce harvest pressure on wild stocks;
2. Provide angling opportunity for increasing numbers of anglers;
3. Diversify angling opportunity (species, location, and access); and,
4. Rehabilitate depleted wild stocks.

Meeting public demand for recreational fishing opportunities in Alaska while at the same time maintaining and protecting the wild fishery resources has become increasingly complex. Today, Alaska is experiencing increased tourism and continued forest, mineral, and petroleum development.

A growing and avid recreation-oriented population accompanies this growing economy. Accessible sport fisheries have become crowded, new fisheries have developed, and pressure from a large mobile population is spilling ever farther afield.

Stocking serves to divert angling pressure away from fragile wild stocks and maintain angling opportunities. Consequently, stocking has become a vital component of the statewide sport fish program.

Recreational fish stocking is funded primarily by two sources. One is the Sport Fish Account of the state Fish and Game fund, which includes revenues from sales of fishing licenses. The second, and larger funding component is the Federal Aid in Sport Fisheries Restoration program, comprised of the Dingell Johnson (D-J) Fund and the Wallop-Breaux Amendment (W-B).

RECENT FISHERY PERFORMANCE

From 1990-1999, fishing effort on the 45 stocked lakes in the Delta management area has ranged from 11,000 to 28,000 angler days, averaging 20,500 days (Table 17). For the same period the catches have ranged from 41,500 to 91,000 fish and harvests have ranged from 15,000 to 47,000 fish. Almost 70% of fishing effort occurs on Quartz Lake. Nearly 70% of catch and harvest in the Delta area is comprised of rainbow trout (Table 17). The ADF&G will continue to stock lakes that provide fishing opportunities and where stocked fish exhibit good survival, growth, or provide put-and-take fisheries. We will evaluate

Table 17.-Summary of fishery statistics for stocked waters in the Delta area, 1990-1999.

Effort	Year									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Number of Anglers ^a	11,912	12,211	10,276	11,942	10,562	12,599	9,271	6,443	7,064	7,774
Number of Days Fished	25,741	22,184	17,559	27,771	22,354	24,653	19,516	10,974	12,652	21,736
Harvest										
Rainbow trout	28,135	31,246	16,934	22,785	14,619	16,447	15,416	11,219	17,287	20,450
Coho/Chinook salmon	7,377	11,474	7,183	10,006	6,690	4,910	6,724	3,119	6,706	6,533
Arctic Grayling	1,171	2,103	332	351	929	417	353	260	110	20
Arctic Char	112	1,874	152	933	511	690	733	650	1,407	2,356
Lake Trout	108	378	172	368	795	241	47	90	7	142
Total	36,903	47,075	24,773	34,443	23,543	22,705	23,273	15,337	25,517	29,502
Catch										
Rainbow trout	63,151	52,868	37,086	59,118	33,925	38,702	31,811	29,241	43,518	59,991
Coho/Chinook salmon	20,324	16,918	15,122	20,713	12,832	10,882	15,597	9,117	15,785	18,192
Arctic Grayling	3,747	3,865	737	3,559	4,860	1,185	2,081	1,448	2,563	2,761
Arctic Char	737	3,326	975	3,055	1,779	1,633	2,229	1,304	3,239	9,200
Lake Trout	284	1,039	537	1,682	1,610	520	148	297	131	748
Total	88,242	78,015	54,457	88,128	55,006	52,922	51,865	41,406	65,236	90,892

new lakes as candidates in the stocking program based on public requests for new fisheries. In the past two years, Square Lake, Kenna Lake, and Dude Lake have been looked into as potential stocking candidates. In November of 2000, Kenna Lake was stocked for the first time with 500 sub-catchable lake trout.

The management cost of the stocking program in 1998 was about \$70,000 (Parker 2000a). In 1999, those costs were estimated to be about \$117,981; for Quartz Lake \$72,000 (Table 18) and small stocked lakes \$45,000 (C. Skaugstad, Alaska Department of Fish and Game, Fairbanks, personal communication).

MANAGEMENT OBJECTIVES

Quartz Lake

In 1999 the stocked waters in the Delta area were classified into major (>5,000 angler-days of effort) and small fisheries. Quartz Lake is the only major fishery. All other lakes are collectively called small stocked lakes.

The stocking program at Quartz Lake provides increased roadside angling opportunity for residents and visitors. Stocking of a variety of sport fish species provides species diversity attractive to anglers. Availability of stocked salmonids in roadside lakes creates year-round fishing opportunity otherwise unavailable in Interior Alaska. Tanana Valley residents surveyed by ADF&G in 1985 and in 1988 indicated that about 80% of the respondents approved of stocking fish as a means to improve fishing.

Effort that might otherwise be directed toward Tanana drainage wild stocks vulnerable to over-fishing is absorbed at Quartz Lake and other stocked lakes. Increasingly restrictive regulations have been implemented to protect wild stocks in interior Alaska. As fishing and harvest pressures upon these stocks have increased, stocking of hatchery fish has become an increasingly effective management option for meeting the demand for recreational fishing opportunities in the Tanana drainage. ADF&G questionnaires sent to license holders in the Tanana drainage show Arctic grayling (wild stocks) are targeted more by anglers than were other species. Rainbow trout was the next most commonly targeted species. However, surveys conducted in 1980, 1985, and again in 1988 indicated that the proportion of anglers fishing specifically for rainbow trout increased, but that the proportion of anglers targeting Arctic grayling decreased.

Quartz Lake supports both a winter ice fishery and an open-water fishery. Creel surveys conducted by ADF&G indicate that about half of the annual fishing effort occurs during the open water period (May through September) and the other half occurs when the lake is covered with ice (October through April). Angler effort for Quartz Lake has averaged 14,700 days, total catches averaged 51,200, and total harvests averaged 23,000 fish from 1990-1999 (Table 18). The average catch rate for the last 10 years is about 3.5 fish per angler day (Table 18).

Specific objectives for Quartz Lake:

- Provide 20,000 annual angler days or more of sport fishing effort.
- Provide diverse sport angling opportunities through the annual or alternate year stocking of rainbow trout, coho salmon, and Arctic char.

Table 18.-Effort, harvest, catch, and cost of stocked fish in Quartz Lake from 1990-1999.

	Year									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Days fished (effort)	19,746	15,478	13,486	17,613	14,031	17,569	14,163	6,956	10,175	17,820
Catch	67,486	60,992	45,156	62,887	34,887	39,307	39,161	29,128	52,462	80,062
Harvest	28,156	39,292	20,597	27,676	17,262	17,392	18,741	11,808	21,062	27,405
Catch rate (catch / effort)	3.4	3.9	3.3	3.6	2.5	2.2	2.8	4.2	5.2	4.5
Stocking cost						\$114,060	\$94,660	\$96,404	\$74,841	\$71,547
Cost-per-day of fishing						\$6.49	\$6.68	\$13.86	\$7.36	\$4.01
Cost-per-fish caught						\$2.90	\$2.42	\$3.31	\$1.43	\$0.89
Cost-per-fish harvested						\$6.56	\$5.05	\$8.16	\$3.55	\$2.61

- Maintain an annual mean catch rate in excess of two sport fish per angler day while allowing anglers to keep the portion of their catch, if they so desire.

To provide for the above objective the department will annually stock 30,000 fingerling Arctic char, 80,000 fingerling coho salmon, and 400,000 fingerling rainbow trout. Performance of the fishery will be evaluated using sport fishing effort and harvest estimate through the Statewide Harvest Survey and status of stocking cohorts evaluated through on-site creel surveys and/or field sampling.

Small Lakes

The small lakes stocking program was intended to provide additional fishing opportunities by increasing the diversity of sport species and fishing experiences available to anglers. Year-round fishing opportunities were created in waters ranging from urban ponds located within or near communities to remote lakes and ponds that were only accessible by trail and by aircraft.

The stocking program has provided alternative opportunities for anglers that might otherwise direct their efforts toward native species of sport fish that are vulnerable to over-fishing. Increasing sport fishing pressure and over-harvest of several species of indigenous fish during the early and mid-1980's resulted in more restrictive regulations in several fisheries of interior Alaska. As harvest pressure has increased, stocking of hatchery fish has become an increasingly important management tool to meet the demand for recreational fishing opportunities in the Tanana drainage.

Since 1990, the five-year moving average for fishing effort in these lakes has ranged from about 19,000 to more than 24,000 angler-days. In order to maintain effort at or above the goal of 20,000 angler days, lakes with the greatest potential for increased fishing effort were emphasized. Lakes with the greatest potential include those near population centers, those that are road accessible, and those that are large.

Urban lakes were stocked annually; and most of the stocked fish usually were of catchable size (8 inches or greater). Catchable-sized fish were stocked as soon as the ice was gone, helping to accommodate angler enthusiasm for spring fishing.

In 1994, an attempt began to manage three lakes, two in the Delta Area (Craig, and Coal Mine #5) for large rainbow trout utilized primarily in a catch-and-release fishery. Winter fishing has been closed, gear restricted to single-hook unbaited flies or lures, and the bag limit reset at one fish over 18 inches.

Specific objectives for small stocked lakes:

- Manage important native populations of fish according to sustained yield principles.
- Provide a combined 20,000 days of sport fishing effort (angler-days) for both upper and lower Tanana drainage lakes.
- Provide sport angling diversity through annual or alternate year stocking of multiple species of sport fish.
- Publicize the fishing opportunities available to anglers.
- Improve public access where needed.

- Manage three small stocked lakes (Little Harding Lake, Craig Lake, and Coal Mine #5) to provide catch-and-release, and/or limited harvest opportunities for larger than average rainbow trout.

The above objectives for small stocked lakes will be evaluated using the sport fishing effort and harvest estimates in the Statewide Harvest Survey. Stocking cohort status may be assessed by periodic on-site sampling, or as a component of research projects.

FISHERY MANAGEMENT

The Division of Sport Fish strategy is to stock species most suited to a particular lake's physical characteristics and at a size to account for lake productivity and harvest pressure. Rainbow trout and Arctic grayling do well in most of our lakes and support our summer fisheries. Coho salmon also do well in most lakes and provide an aggressive fish during winter when other species are less active. Arctic char and lake trout are long lived and grow to large size that makes them attractive to anglers. In some lakes more than one species are stocked to provide diversity and to take advantage of different seasonal behavior. Rainbow trout and coho salmon are the most popular combination.

The state hatcheries are able to provide us with different size fish from sac-fry (1 inch) to catchables (6-10 inches), and even excess brood stock fish (12-18 inches). Because lakes have different capabilities for producing catchable fish, ADF&G requests different size fish to meet certain stocking objectives. Fingerling rainbow trout and coho salmon are stocked in Quartz Lake because the lake produces sufficient numbers of catchable fish from fingerling stockings. In small roadside lakes like Little Lost Lake, Rich 81, and J Lake, ADF&G stocked catchable rainbow trout and Arctic grayling. These lakes are small and received a lot of fishing pressure relative to their size. As a result, they can't produce sufficient numbers of catchable fish (from stockings of fingerlings) to meet angler demand. The department also stocked some of the high use lakes early in the spring and again one or more times during the summer to provide sufficient numbers of fish through out the year. Prior to altering the stocking strategy, anglers were expressing frustration with these fisheries because by spring there were too few large fish.

The ADF&G generally stocked the remote and larger rural lakes with fingerlings because smaller fish are easier and less expensive to transport than larger fish. All of these lakes produced sufficient numbers of catchable fish from fingerling stockings to sustain the existing fisheries. Because these lakes are more difficult to reach, the level of effort and harvest is less than that for comparable size lakes near the road system. Generally, these lakes produce larger fish and more of them for the same reasons.

Recently the department started stocking catchable rainbow trout in lakes near Delta that don't usually support fish through winter. By stocking such lakes with catchable size fish ADF&G has created instant and popular fisheries. The department's goal is to stock only enough fish to support the spring and summer fishing season because any fish left in the lake may not survive the winter. This recent change to the stocking program has increased the number of lakes that can be stocked and increased angler opportunity.

Stocking Products

The state fish hatcheries at Ft. Richardson and Elmendorf Air Force Base near Anchorage produce rainbow trout, Arctic grayling, Arctic char, coho and chinook salmon, and lake

trout. All species except chinook salmon are stocked in the Delta area. Fish are transported by truck to the stocking location or they are transferred to off road vehicles or aircraft for transport to more remote locations.

Rainbow Trout

Rainbow trout is the primary hatchery product used in lake stocking. All rainbow trout are from a captive brood stock maintained at Fort Richardson Hatchery. The brood stock is descended from wild Swanson River rainbow trout. The stocking program uses two genetic types of rainbow trout: 1) mixed sex diploid fish which are normal fish capable of reproduction; and 2) all-female triploid fish which are female fish not capable of reproduction.

The department generally stocks three sizes of rainbow trout. Catchable rainbow trout are 1 year old and are about 6-10 inches. Sub-catchable rainbow trout are 6 months to 1 year old and are 4-6 inches. Fingerling rainbow trout are usually 2 to 4 months old and are 2-3 inches. Rainbow trout fry are less than 2 months old and usually weighed less than a gram.

Arctic Grayling

All stocked Arctic grayling are from eggs taken from two wild stocks (Tanana River and Moose Lake-Gulkana River). Only the Moose Lake – Gulkana River stock is used for stocking in the Delta area. No captive brood stock is maintained in the hatchery. We produce four sizes of Arctic grayling for stocking. Catchable Arctic grayling are 1 year old and are 6-9 inches. Subcatchables Arctic grayling are 6 months to 1 year old and weigh between 4-6 inches. Fingerling Arctic grayling are usually 2 to 4 months old and are 2-3 inches. Arctic grayling fry are less than 2 months old and usually weigh less than a gram. Arctic grayling sac-fry are newly hatched and are about 1 inch.

Arctic Char

All stocked Arctic char are from eggs taken from a wild stock of fish. The brood stock currently used is from the Bristol Bay Area. No captive brood stock is maintained in the hatchery. Due to the difficulty of conducting a wild egg-take and the longevity of this species, eggs are only taken every other year. Generally we stock three sizes of Arctic char. Catchable Arctic char are 1 ½ years old and are 6-10 inches. Subcatchable Arctic char are 6 months old and are 5-7 inches. Fingerling Arctic char are usually 4 to 6 months old and are 4-5 inches.

Coho Salmon

All coho salmon used for lake stocking are from eggs taken from hatchery-produced adults. Brood stock use may vary depending on availability. Two sizes of coho salmon are stocked. Subcatchable coho salmon are 1 year old and are 4-6 inches. Fingerling coho salmon are 2 to 4 months old and are 2-4 inches.

Lake Trout

All lake trout from the hatcheries are from eggs taken from wild stocks. The brood stock currently used is from Seven-mile Lake (Yukon River drainage) near Paxson. No captive brood stock is maintained in the hatchery. Due to the difficulty of conducting a wild egg-take and the longevity of this species, eggs are only taken every other year. Two sizes of lake trout are stocked. Catchable lake trout are 1 ½ years old and weigh an average of 100g. Fingerling lake trout are usually 4 to 6 months old and weigh between 5 and 10g.

Egg Takes

The Region III stocking program currently assists the hatcheries with eggtakes by capturing and holding fish until they are ready for spawning. When Clear Hatchery was closed in 1997, staff in the regional office assumed responsibility for conducting eggtakes in the Tanana drainage and the Upper Copper/Susitna drainages. Other assumed responsibilities included locating wild donor stocks, evaluating their population status, and collecting and holding adults until ready for artificial spawning. To fulfill these new responsibilities a new budget separate from other stocked water evaluation work was given to Region III.

The objective for lake trout is to collect 88,000 fertilized eggs (about 84 females) from the lake trout population in Sevenmile Lake. Since 1987, the Alaska Department of Fish and Game (ADF&G) has collected eggs from wild lake trout *Salvelinus namaycush* populations at Paxson Lake and Sevenmile Lake. Eggs were collected in the fall and were incubated at state hatcheries during winter. The progeny were reared at the hatchery for up to one year. These fish were then stocked as fingerlings (4g) up to catchables (100g) in several lakes in the Tanana drainage and Mat-Su area to enhance sport-fishing opportunities. Fertilized eggs collected for the lake-stocking program are now taken every two years from the lake trout population in Sevenmile Lake, which lies in the Tanana River drainage. Lake trout typically spawn at night in large aggregations in shallow water over rock reefs. Known spawning sites are at the south end of the lake. Gametes are usually taken within a week of capture.

Eighty-four females are required to provide about 88,000 eggs to meet stocking requests for subcatchables (20 g) in 2000 and catchables in 2001 (Table 19). Eighty-four males will be used to fertilize the eggs. Twelve thousand eggs are required for a study to evaluate artificial incubation methods in Sevenmile Lake.

Table 19.-Lake Trout egg requirement worksheet for Sevenmile Lake.

Subcatchables needed to stock in 2000 ^a		41,000
Catchables needed to stock in 2001 ^a		5,000
Total fish needed from 1999 egg take		46,000
Survival - egg to subcatchable	~53%	77,652
Survival - egg to catchable	~50%	9,968
Eggs for incubation study in 1999		3,600
Total eggs needed		91,220
Fecundity - eggs/female		1,200
Females to spawn		80

^a Data are modified from the *Statewide Stocking Plan for Recreational Fisheries 2000-2004* (Alaska Department of Fish and Game 2000).

During the year in which an egg-take occurs, about 30% of the total estimated egg production is collected for the stocking program. Because the department now conducts

alternate year eggtakes, only 15% of the total estimated egg production is removed over two years. This is an acceptable level for this population. In 1999, the department estimated 1,260 (SE 185) lake trout in the population 361 mm and larger (Parker 2000 *In prep*). Egg takes were conducted starting in September 1993 and occurred again in 1995, 1997 and 1999. The removal of potential annual production ranged from 12 – 26% during the four years eggs were taken (Parker and Wuttig *In print*). An increasing trend in population size since 1995 indicates that removal of production is not having an adverse impact.

Net-Catch Sampling

We have numerous requests from anglers for current information on the species and size of fish in our lakes in the Delta area. Anglers use this information to plan fishing trips. Each year we attempt to sample the fish populations in 4 to 6 lakes in the Delta management area. Most of these lakes are stocked so there is usually no conservation concerns driving the need for information on these fish populations. However, anglers are interested in the species and the size of the fish in these lakes. We use this information to update our *Guide to Stocked Waters*, Internet web site, and informational leaflets. An additional benefit is that biologists are able to observe the fish populations in several lakes and get a rough idea of their status. From these observations the biologist can judge if a fish population needs further investigation and plan a study to address a specific concern.

Lake Mapping and Limnology

Each year we list a number of lakes that we want to map or inspect. The actual number of lakes that we visit depends on the time available, the priority of other projects and for some lakes if aircraft or ATVs are available. We map lakes to obtain depth data for producing bathymetric maps for anglers and to describe morphology and other lake characteristics for fishery managers. While we are at these lakes we often combine this activity with other activities such as net sampling (described above), water chemistry assays, dissolved oxygen and temperature profiles, and evaluate land-locked status.

Statewide Stocking Plan: Region III Update

The five-year stocking plan for Region III is updated each year in response to public comment, changes in Fishery Management Plans and hatchery production, and to comply with current policies. Comments received from the public and current policies are reviewed to determine what changes will be required to update the stocking plan each year. The updated stocking plan for Region III is submitted to Sport Fish Headquarters in November for inclusion into the draft Five Year Statewide Stocking Plan for Recreational Fishing. After a comment period the finalized plan is usually published and available by 1 February.

Fish Transport Permits

Each fish stocking and egg take requires a Fish Transport Permit (FTP). The Five Year Stocking Plan, regional management plans, and active FTPs are crosschecked prior to stocking or taking eggs to determine if an active FTP exists. Any FTP needed for stocking or for an egg take is submitted for approval. A list of active, expired, and pending FTPs are maintained at the Fairbanks office.

Hatchery Review

Fish hatchery management and operational plans for Ft. Richardson and Eielson Air Force Base hatcheries are reviewed to ensure the plans account for the correct number, size, species, brood stock, and other special requirements for fish requested through the Five Year Stocking Plan and regional management plans. Requests from the various regions are checked against hatchery production capabilities to determine if requests are feasible. Hatchery and stocking managers discuss options to decrease impact of eggtakes on wild donor stocks and to make the stocking program more efficient. In November 1999 the Arctic char and chinook salmon programs were reviewed by statewide staff.

Pamphlets

Pamphlets about stocked waters in the Delta management area are updated each year with information collected on fish populations such as the species present and their size. Other information includes recent stocking histories, location and bathymetric maps, and available facilities.

FISHERY OUTLOOK

The Sport Fish Division's projected game fish stockings for the Delta Area for 2000-2001 is listed in Table 20.

Table 20.-Summary of projected game fish stockings for Delta area stocked lakes, 2000-2001.

Number of Lakes 2000/2001	Species	Lifestage	Target Size (in)	2000 Projected	2001 Projected
0/11	Arctic char	Subcatchable	5-6	0	19,725
1/0	Chinook salmon	Catchable	6-10	10,000	0
4/1	Coho salmon	Fingerlings	3-5	95,600	80,000
0/8	Grayling	Catchable	6-10	0	2,650
9/0	Lake trout	Subcatchable	5-6	13,600	0
2/3	Rainbow trout	Broodstock	12-16	50	75
5/7	Rainbow trout	Catchable	6-10	6,300	7,800
8/27	Rainbow trout	Fingerlings	2-5	335,800	439,800

BOARD OF FISHERY ACTIONS

In 1994 Region III initiated a program to create fisheries for trophy size rainbow trout in Little Harding Lake (22 ha), Craig Lake (7 ha) and Coal Mine #5 Lake (5 ha). Special regulations were adopted by the BOF in 1997 for these lakes to increase the likelihood of creating successful fisheries. These lakes are open to fishing from 15 May through 30 September. Only unbaited, single-hook, artificial lures can be used. The daily bag and possession limit for rainbow trout is one fish which must be 18 inches (457 mm) or larger. In 2000, proposal 196 before the BOF asks to repeal special regulations on two lakes (Coal Mine #5 and Craig Lake) because the objectives of the program were not met. In proposal 214 it is recommended that one or two additional lakes (selected from Bluff Cabin, Lisa, Donnelly, Rainbow, and /or Monte lakes) be included in the "large stocked

fish” management category. After five years the regulation on the new lake(s) will default to the general regulations if objectives are not met.

CURRENT ISSUES

Since 1995, the rainbow trout populations in Craig Lake and Coal Mine #5 Lake have been evaluated every year to evaluate progress toward providing trophy fisheries. In Craig Lake and Coal Mine #5 Lake there were fewer and smaller fish than expected. The department tried stocking larger fish in these two lakes but poor results continued. Comparison with length frequency histograms from past years show fish larger than 360 mm were not present in the populations in Craig Lake and Coal Mine #5 Lake (Table 21).

Table 21.-Number of fish stocked, abundance and size of fish in Craig and Coal Mine #5 lakes from 1994-2000.

Lake	Year							
	1994	1995	1996	1997	1998	1999	2000	2001
Craig Lake^a								
Number stocked ^b	850	949	550	846	652	435	0	2000 ^c
Abundance est.	na	na	429	179	191	na	na	
Number of fish <14"	na	na	429	178	187	na	na	
Number of fish >14"	na	na	0	1	4	na	na	
Number of fish >18"	na	na	0	0	0	na	na	
Coal Mine #5^a								
Number stocked ^b	750	450	450	856	763	333	0	2000 ^c
Abundance est.	na	na	67	na	958	na	na	
Number of fish <14"	na	na	67	na	922	na	na	
Number of fish >14"	na	na	0	1	36	na	na	
Number of fish >18"	na	na	0	0	0	na	na	

^a Craig and Coal Mine lakes both have special management regulations to grow large fish

^b Since 1994 density of fish stocked was dropped to less than 100 per hectare to reduce competition and allow greater growth.

^c Maximum stocking of fingerling rainbow trout.

The department suggests that Craig Lake and Coal Mine #5 Lake be dropped from the trophy rainbow trout program.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

In 1994 Region III initiated a program to create fisheries for trophy size rainbow trout in Little Harding Lake (22 ha), Craig Lake (7 ha) and Coal Mine #5 Lake (5 ha). Success in establishing fisheries for trophy rainbow trout in Little Harding Lake, Craig Lake, and

Coal Mine #5 Lake had criteria based on size. For these fisheries to be considered successes, at least half of an age cohort must exceed 14 inches (356 mm) by age-4. When stocked these fish were age-1 and averaged 150 to 180 mm. This objective was not met and the recommendation was to discontinue the program in Craig and Coal Mine #5. The program will continue in Little Harding Lake where objectives are being met.

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Appendix A

Appendix A1.-All water reported in State Wide Harvest Survey for the Delta Area portion of the Tanana River drainage in 1999 (Howe et al. 2000 *In print*).

Lakes and Ponds	Anglers	Trips	Days	KS	SS	LL	CS	LT	DV/ AC		RT	GR	GR	WFH	WFR	SF	WFO	NP	NP	BB	OTHER	Respond
Delta Clearwater River	1,859	3,052	5,705	0	76	0	0	0	0	0	0	0	0	0	7	0	7	0	0	0	0	73
Richardson Clearwater River	168	305	1,253	0	0	0	0	0	0	0	0	0	139	0	0	0	0	0	0	0	9	
Goodpaster River	594	613	1,915	0	0	0	0	0	0	0	677	175	0	0	0	0	9	9	51	0	19	
Quartz Lake	6,125	9,040	17,812	0	0	5,614	0	0	2,179	18,179	0	0	0	0	0	0	0	0	0	0	218	
George Lake	725	656	1,417	0	0	0	0	0	0	0	0	0	0	0	0	0	307	37	0	0	25	
Volkmar Lake	75	204	311	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0	3	
Fielding Lake	749	468	1,154	0	0	0	0	43	0	0	172	473	0	0	0	0	0	0	0	0	25	
Tangle Lakes & Tangle River	2,691	2,063	4,513	0	0	0	0	484	0	0	560	1,202	0	0	0	0	0	0	8	0	101	
Shaw Creek	189	202	270	0	0	0	81	0	0	0	0	45	0	0	0	0	0	0	127	0	9	
Delta River (below Tangle Lakes)	378	356	1,023	0	0	0	0	14	0	0	147	493	0	0	0	0	0	0	0	0	14	
Other Streams in upper Tanana (50% of the total)	149	237	483	0	43	0	0	0	0	0	35	88	0	0	0	0	5	0	0	0	6	
Other Lakes in the lower Tanana River (50% of the total)	464	671	1,264	0	0	0	0	169	0	263	12	40	0	0	0	0	0	0	0	0	16	
Bluff Cabin Lake	90	51	182	0	0	0	0	0	0	70	0	0	0	0	0	0	0	0	0	0	2	
Bolio Lake	75	268	584	0	0	0	0	14	0	175	0	0	0	0	0	0	0	0	0	0	2	
Chisana River	15	26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	1	
Clearwater Creek (U)	93	89	124	0	0	0	0	0	0	0	56	0	0	0	0	0	0	0	0	0	4	
Craig Lake	16	12	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Donna Lake	105	89	324	0	120	356	0	0	0	105	0	0	0	0	0	0	0	0	0	0	2	
Donnelly Lake	108	38	108	0	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Fish Lake	30	38	195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Four Mile Lake (Taylor Hwy)	108	140	202	0	0	0	0	45	0	70	0	0	0	0	0	0	0	0	0	0	4	
Gardiner Creek	105	38	195	0	0	0	0	0	0	0	11	45	0	0	0	0	0	0	0	0	2	
Glacier Creek	30	26	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Healy Lake	30	38	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Island Lake (30 mi SE Northway Junction)	60	26	233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	282	0	0	1	

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Lakes and Ponds	Anglers	Trips	Days	KS	SS	LL	CS	LT	DV/ AC	RT	GR	GR	WFH	WFR	SF	WFO	NP	NP	BB	OTHER	Respond
Jan Lake	79	101	127	0	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Koole Lake	252	217	348	0	0	0	0	0	0	1,023	0	0	0	0	0	0	0	0	0	0	11
Landmark Gap Lake	55	71	73	0	0	0	0	35	0	0	79	0	0	0	0	0	0	0	0	0	4
Lisa Lake	45	13	45	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	1
Little Tok River	91	101	159	0	0	0	0	0	0	0	34	79	0	0	0	0	0	0	0	0	4
Little Lost Lake (near Quartz Lake)	45	77	156	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	2
Mansfield Lake	45	13	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Mineral Lake	144	135	323	0	0	0	0	0	0	0	11	41	0	0	0	0	66	28	0	0	5
Monte Lake	16	75	76	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	1
Nabesna River	30	128	259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	1
Rock Creek (U)	109	88	145	0	0	0	0	0	0	0	11	23	0	0	0	0	0	0	0	0	5
Middle Tanana River (upper Tanana 30% of total)	245	758	969	10	23	0	4	0	10	0	3	7	0	2	0	0	3	0	580	0	12
Tok River	105	51	156	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	3
Tangle River	34	43	79	0	0	0	0	0	0	0	0	42	0	0	0	0	0	0	0	0	3
Sevenmile Lake (Denali Hwy)	30	13	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
T Lake	33	25	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	1
Fielding Creek	60	13	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rock Creek (Denali Hwy)	33	12	51	0	0	0	0	0	0	0	63	0	0	0	0	0	0	0	0	0	1
Forrest Lake	60	64	104	0	0	0	0	0	0	280	0	0	0	0	0	0	0	0	0	0	2
Little Donna Lake	90	77	104	0	0	0	0	0	0	292	0	0	0	0	0	0	0	0	0	0	3
Weasel Lake(Ft. Greely)	30	26	30	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	1
Bullwinkle Lake (Ft. Greely)	15	13	15	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	1
Hidden Lake (near Tok)	45	217	220	0	0	0	0	0	0	117	0	0	0	0	0	0	0	0	0	0	2
Clear Creek (U)	15	26	26	0	0	0	0	0	0	0	23	45	0	0	0	0	0	0	0	0	1
Glacier Lake (or Gap Lake)	30	26	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Jack Creek (U)	45	38	52	0	0	0	0	0	0	0	11	23	0	0	0	0	0	0	0	0	2

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Lakes and Ponds	Anglers	Trips	Days	KS	SS	LL	CS	LT	DV/ AC	RT	GR	GR	WFH	WFR	SF	WFO	NP	NP	BB	OTHER	Respond
Rainbow Lake (U)	75	77	233	0	0	0	0	0	0	58	0	0	0	0	0	0	0	0	0	0	2
Island Lake (U)	75	13	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Deadman Lake (AK Hwy near Northway)	105	38	272	0	0	0	0	0	0	0	0	0	0	0	0	0	122	0	0	0	2
Beaver Creek (U)	15	13	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Upper Tanana River	362	663	863	11	0	0	0	0	110	0	248	79	0	0	0	0	28	47	181	0	16
Lower Tangle Lake	30	13	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Upper Tangle Lake	30	38	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Brodie Lake (Coal Mine Rd.)	30	13	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Berry Creek (U)	15	13	26	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	0	1
Healy River	15	26	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Meadow Road Lakes	121	190	220	0	0	0	0	0	0	183	0	0	0	0	0	0	0	0	0	0	5
Coal Mine Road Lakes	466	344	751	0	0	0	0	14	22	93	0	0	0	0	0	0	0	0	0	0	18
Dot Lake	30	192	233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Mundcho Lake	15	13	519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Fern Lake	30	26	78	0	0	0	0	0	0	0	0	0	0	0	0	0	38	9	0	0	1
Entire Tanana River drainage total	30,833	94,996	160,427	1,001	451	8,637	474	1,145	4,851	48,226	3,405	8,118	45	124	114	661,939	986	3,148	0	1,124	
Upper Tanana drainage waters	9,637	22,839	46,809	21	322	6,016	85	818	2,332	21,178	2,153	3,072	0	9	0	7	868	148	1,074	0	
% Upper management area to total	0.31	0.24	0.29	0.02	0.71	0.70	0.18	0.71	0.48	0.44	0.63	0.38	0.00	0.07	0.00	0.11	0.45	0.15	0.34	0.00	

Appendix A2.-Stocking records for Delta area lakes, 1999.

Location	Species	Date	Number Stocked	Average Length (in)	Size
Backdown Lake	Arctic char	9/22/99	503	Fingerling	4.5
Big D Pond	Rainbow trout	5/26/99	1,473	Catchable	8.5
Bluff Cabin Lake	Rainbow trout	7/26/99	6,905	Fingerling	2.1
Bolio Lake	Rainbow trout	5/26/99	2,586	Catchable	9.3
Brodie Lake	Arctic char	9/22/99	434	Fingerling	4.5
Brodie Lake	Arctic grayling	6/7/99	45	Catchable	8.2
Brodie Lake	Arctic grayling	6/7/99	275	Catchable	8.8
Bullwinkle Lake	Rainbow trout	8/9/99	833	Fingerling	2.2
Chet Lake	Rainbow trout	8/9/99	1,667	Fingerling	2.2
Coal Mine #5	Rainbow trout	6/7/99	333	Catchable	10.4
Craig Lake	Rainbow trout	5/26/99	435	Catchable	9.3
Dicks Pond	Arctic char	9/22/99	434	Fingerling	4.5
Doc Lake	Rainbow trout	8/9/99	556	Fingerling	2.2
Donna Lake	Rainbow trout	7/26/99	11,488	Fingerling	2.1
Donnelly Lake	Arctic char	9/22/99	4,939	Fingerling	4.5
Donnelly Lake	Rainbow trout	8/9/99	13,278	Fingerling	2.2
Forest Lake	Rainbow trout	7/26/99	2,500	Fingerling	2.1
Four Mile Lake	Rainbow trout	7/30/99	20,000	Fingerling	2.2
Ghost Lake	Rainbow trout	8/9/99	1,111	Fingerling	2.2
Hidden Lake	Rainbow trout	8/12/99	4,022	Fingerling	2.0
J Lake	Arctic grayling	6/7/99	536	Catchable	8.8
Jan Lake	Rainbow trout	7/30/99	9,036	Fingerling	2.2
Kens Pond	Arctic char	9/22/99	434	Fingerling	4.5
L Donna Lake	Rainbow trout	7/26/99	6,000	Fingerling	2.1
Last Lake	Arctic char	9/22/99	434	Fingerling	4.5
Lisa Lake	Rainbow trout	7/26/99	10,000	Fingerling	2.1
Little Lost Lake	Rainbow trout	5/26/99	500	Catchable	9.3
Luke Lake	Arctic grayling	6/7/99	300	Catchable	8.2
Mark Lake	Rainbow trout	8/9/99	9,155	Catchable	2.2
Monte Lake	Rainbow trout	7/26/99	18,000	Catchable	2.1
N Twin Lake	Rainbow trout	8/9/99	2,000	Catchable	2.2
Nickel Lake	Arctic grayling	6/7/99	250	Fingerling	8.8
Nickel Lake	Rainbow trout	8/9/99	1,111	Catchable	2.2
No Mercy Lake	Rainbow trout	8/9/99	666	Fingerling	2.2
Pauls Pond	Arctic grayling	6/7/99	250	Catchable	8.2

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Location	Species	Date	Number Stocked	Average Length (in)	Size
Quartz Lake	Arctic char	8/22/99	11,047	Fingerling	3.9
Quartz Lake	Coho salmon	6/3/99	78,727	Fingerling	2.9
Quartz Lake	Rainbow trout	7/26/99	228	Fingerling	2.1
Quartz Lake	Rainbow trout	7/27/99	294,593	Fingerling	2.1
Quartz Lake	Rainbow trout	8/22/99	647	Catchable	6.3
Rainbow Lake	Rainbow trout	7/26/99	7,000	Fingerling	2.1
Rangeview Lake	Arctic char	9/22/99	434	Fingerling	4.5
Rangeview Lake	Arctic grayling	6/7/99	240	Catchable	8.8
Rapids Lake	Rainbow trout	8/9/99	1,000	Fingerling	2.2
Rich 81	Rainbow trout	5/26/99	300	Catchable	9.3
Robertson Lake #2	Rainbow trout	7/26/99	3,000	Fingerling	2.1
Rockhound Lake	Rainbow trout	8/9/99	666	Fingerling	2.2
S Johnson Lake	Rainbow trout	7/26/99	1,400	Fingerling	2.1
S Twin Lake	Rainbow trout	8/9/99	4,444	Fingerling	2.2
Shaw Pond	Arctic char	9/22/99	359	Fingerling	4.5
Shaw Pond	Rainbow trout	5/26/99	1,000	Catchable	9.3
Weasel Lake	Rainbow trout	7/26/99	1,600	Fingerling	2.1